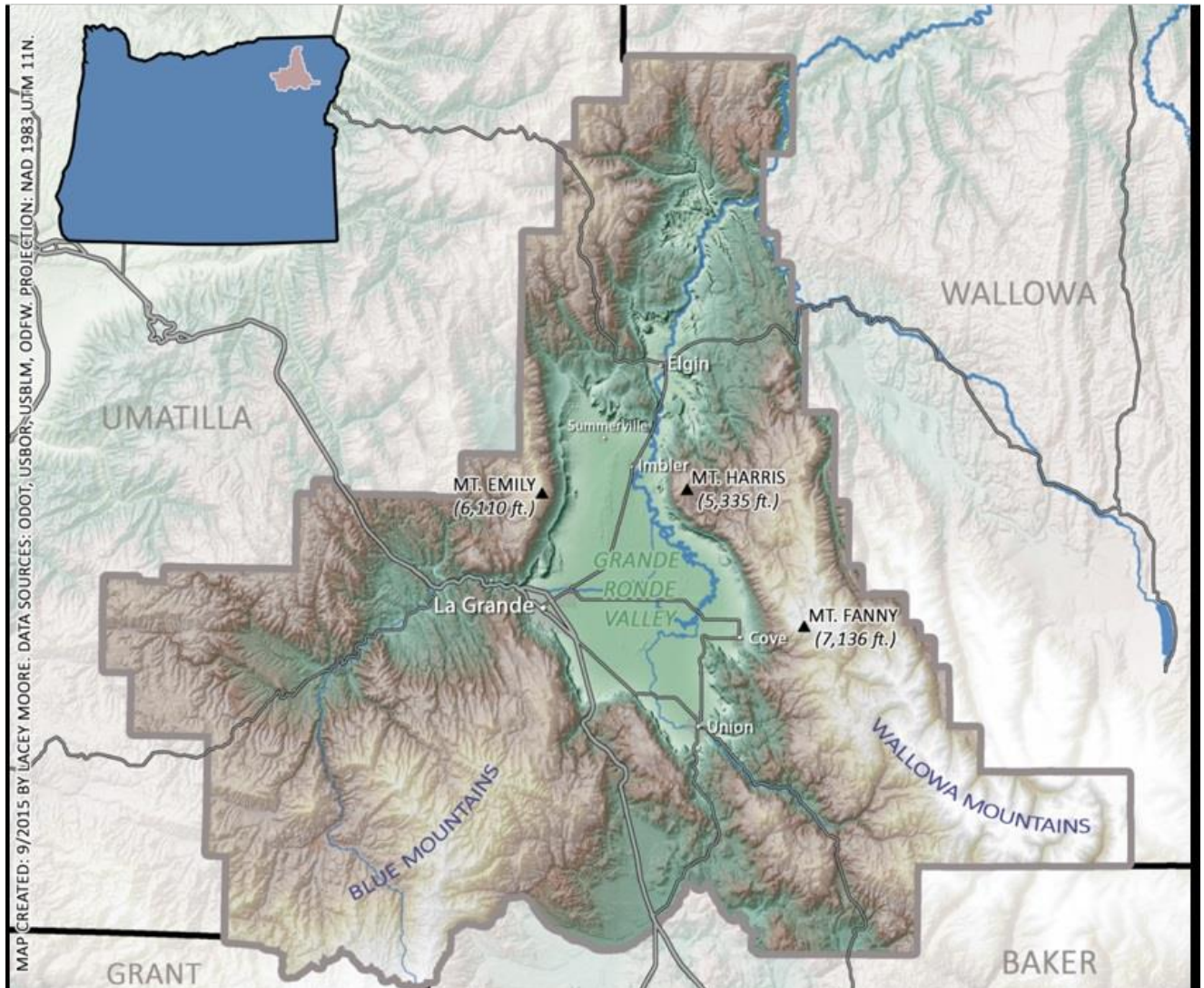


If submitting public comment on this document, please email to em@union-county.org and include reference to page number and/or section comment pertains to. Comments will be accepted through October 29, 2021.

Union County

Natural Hazard Mitigation Plan



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Union County, Oregon

Multijurisdictional Natural Hazard Mitigation Plan

Prepared in 2014 by:

Oregon Partnership for Disaster Resilience
1209 University of Oregon,
Eugene, OR 97403

Updated in 2021 by:

Union County Emergency Services
1106 K Avenue
La Grande, OR 97850

Table of Contents

Volume I: Natural Hazard Mitigation Plan	7
Section 1: Introduction.....	7
Section 2: Community Profile.....	14
Section 3: Mission, Goals, and Action Items	27
Section 4: Plan Implementation and Maintenance	30
Volume II: Hazard Annexes	38
Drought	41
Earthquake	48
Flood	60
Landslide	70
Wildfire	80
Severe Weather.....	81
Volume III: Mitigation Resources	91
Appendix A: Action Item Forms	91
Appendix B: Planning Process.....	111
Appendix C: Grant Programs	121
Appendix D: Economic Analysis of Natural Hazard Mitigation Projects	125
Appendix E: FEMA Review Tool.....	135

Acknowledgements

Union County performed this 2021 Natural Hazard Mitigation Plan update by thoroughly reviewing and revising the prior plan utilizing in house staff, and in consultation and cooperation with partner agencies. The plan was previously updated in 2014 through a regional partnership funded by the Federal Emergency Management Agency (FEMA) Pre-Disaster Mitigation Competitive Grant Program. FEMA awarded the grant to support the update of the natural hazard mitigation plan. The County’s planning process utilized a four-phased planning process, plan templates and plan development. This current plan update builds on previous planning efforts.

Project Update Steering Committee:

Steering Committee	
American Red Cross	Heather Stanhope
Avista Natural Gas	Greg Ford
Center for Human Development	George Thompson
City of Union Administrator	Doug Wiggins
Cove Public Works Director	Dave Johnson
Elgin School District	Dianne Greif
Grande Ronde Hospital	April Brock
Imbler Fire Chief	Mike Barry
La Grande Administrator	Robert Strobe
La Grande Chief of Police	Gary Bell
La Grande Fire Chief	Emmitt Cornford
La Grande Public Works Director	Kyle Carpenter
La Grande Rural Fire Chief	Craig Kretschmer
Oregon Department of Forestry	Logan McCrae
Oregon Department of Forestry	Mitch Williams
Oregon Department of Transportation	Sean Rohan
Union County Emergency Manager	JB Brock
Union County Emergency Services	Annette Powers
Union County Sheriff	Cody Bowen
Union County Soil & Water Conservation District	Jim Webster
Ziply Fiber	Diana Anderson

Plan Adoption:

Insert letters of promulgation/resolutions.

DRAFT

Volume I: Natural Hazard Mitigation Plan

Section 1: Introduction

What is Natural Hazard Mitigation?

Natural hazard mitigation is defined as reducing or alleviating the losses of life, property and injuries resulting from natural hazards through long and short-term strategies. Example strategies include policy changes, such as updated ordinances; projects, such as seismic retrofits to critical facilities; and education and outreach to targeted audiences, such as Spanish speaking residents, or the elderly. Mitigation is the responsibility of the public, private businesses and industries, state and local governments, and the federal government.

Engaging in mitigation activities provides jurisdictions with a number of benefits, including reduced loss of life, property, essential services, critical facilities and economic hardship; reduced short-term and long-term recovery and reconstruction costs; increased cooperation and communication within the community through the planning process; and increased potential for state and federal funding for recovery and reconstruction projects.

Why Develop a Mitigation Plan?

Union County developed this Natural Hazard Mitigation Plan in an effort to reduce potential future loss of life and damage to property resulting from natural hazards. It is impossible to predict exactly when hazard events will occur, or the extent to which they will affect the County and community assets. However, with careful planning and collaboration among public agencies, private sector organizations, and citizens within the community, it is possible to minimize the losses that can result from natural hazards. The figure below is utilized to illustrate the concepts of risk reduction.

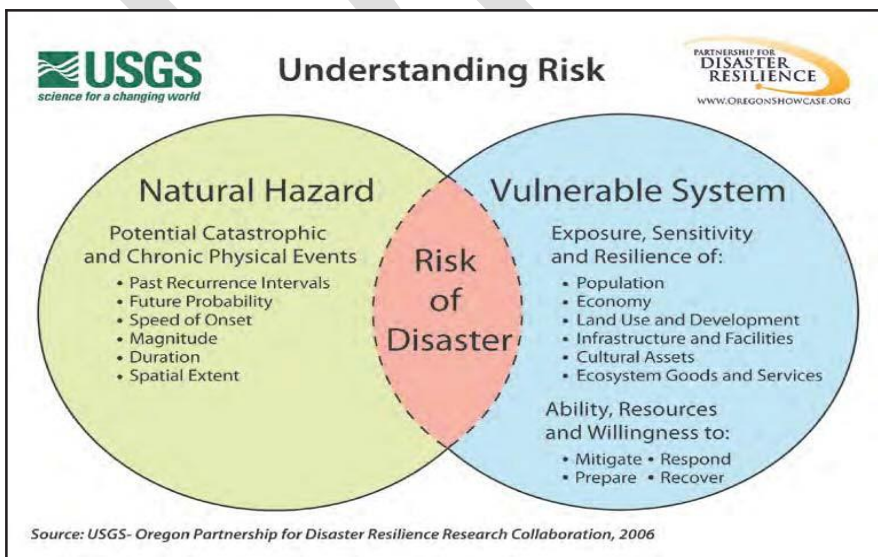


Figure 1.1:
Understanding Risk

This plan focuses on the historical natural hazards that could and have affected Union County, Oregon, and its incorporated cities, which include drought, earthquake, flood, landslide, severe weather, wildfire, and winter storms. The dramatic increase in the costs associated with natural disasters over the past decades has fostered interest in identifying and implementing effective means of reducing vulnerability. A report submitted to Congress by the National Institute of Building Science's Multi-Hazard Mitigation Council (MMC) highlights that for every dollar spent on mitigation, society can expect an average savings of \$4. This Natural Hazard Mitigation Plan is intended to assist all participating jurisdictions in reducing risk from natural hazards by identifying resources, information, and strategies for risk reduction.

The plan is strategic and non-regulatory in nature, meaning that it does not necessarily set forth any new policies. It does, however, provide: (1) a foundation for coordination and collaboration among agencies and the public in Union County; (2) identification and prioritization of future mitigation activities; and (3) aid in meeting federal planning requirements and qualifying for assistance programs. The mitigation plan works in conjunction with other County plans and programs including Comprehensive Land Use Plans, Emergency Response and Recovery Plans, Capital Improvement Plans, Place-based Water Resource Plan, Natural Resource Plan, Community Wildfire Protection Plan, the Cohesive Wildfire Strategy, and the State of Oregon Natural Hazard Mitigation Plan.

The plan provides a set of actions to prepare for and reduce the risks posed by natural hazards through education and outreach programs, the development of partnerships, and the implementation of preventative activities such as land use or watershed management programs. The actions described in the plan are intended to be implemented through existing plans and programs within Union County.

What is the County's Overall Risk to Hazards?

Oregon currently uses a county by county methodology to assess the probability of and vulnerability to natural hazard events. The hazard annexes in Volume II of this plan present probability and vulnerability scores for each hazard within Union County. Table I.1.1. below summarizes the hazard probability and vulnerability scores for Union County.

Table I.1.1: Hazard Analysis Worksheet

Hazard Analysis Worksheet – Union County 2021													
	History			Vulnerability			Maximum Threat			Probability			
Hazard	Severity	Weight Factor	Subtotal	Severity	Weight Factor	Subtotal	Severity	Weight Factor	Subtotal	Severity	Weight Factor	Subtotal	Total Threat Score
Severe Winter Weather	8	2	16	8	5	40	9	10	90	8	7	56	202
Flood	7	2	14	5	5	25	6	10	60	6	7	42	141
Seismic/Earthquake	2	2	4	7	5	35	8	10	80	2	7	14	133
Wildfire	6	2	12	5	5	25	5	10	50	5	7	35	122
Drought	5	2	10	5	5	25	5	10	50	5	7	35	120
Extreme Heat	5	2	10	5	5	25	5	10	50	5	7	35	120
Windstorm/Tornado	4	2	8	4	5	20	5	10	50	5	7	35	113
Dust Storm	3	2	6	4	5	20	4	10	40	4	7	28	94
Dam Failure	2	2	4	3	5	15	4	10	40	2	7	14	73
Landslide	3	2	6	3	5	15	3	10	30	3	7	21	72

This Hazard Analysis was performed in 2021 by the Union County Natural Hazard Mitigation Steering Committee and a group of agency and public representatives. This resulting table of hazards has been modified to exclude non-natural hazards.

Table I.1.2: Union County Risk Analysis Summary

Union County		
Hazard	Probability	Vulnerability
Severe Winter Weather	High	High
Flood	High	Moderate
Seismic/Earthquake	Low	High
Wildfire	Moderate	Moderate
Drought	Moderate	Moderate
Extreme Heat	Moderate	Moderate
Windstorm/Tornado	Moderate	Low
Dust Storm	Low	Low
Dam Failure	Low	Low
Landslide	Low	Low

This table reduces the hazards shown in Table I.1.1 to a simpler list for use in developing Action Items (see Appendix A).

Policy Framework for Natural Hazards in Oregon

Planning for natural hazards is an integral element of Oregon’s statewide land use planning program, which began in 1973. All Oregon cities and counties have comprehensive plans and implementing ordinances that are required to comply with the statewide planning goals. The challenge faced by state and local governments is to keep this network of local plans coordinated in response to the changing conditions and needs of Oregon communities.

Statewide land use planning Goal 7: Areas Subject to Natural Hazards calls for local plans to include inventories, policies and ordinances to guide development in or away from hazard areas. Goal 7, along with other land use planning goals, has helped to reduce losses from natural hazards. Through risk identification and the recommendation of risk-reduction actions, this plan aligns with the goals of the jurisdiction’s Comprehensive Plan, and helps each jurisdiction meet the requirements of statewide land use planning Goal 7.

The primary responsibility for the development and implementation of risk reduction strategies and policies lies with local jurisdictions including the Union County Board of Commissioners, Emergency Services, Sheriff’s Office, Public Works, La Grande/Union County Building Department, City Councils, City Managers/Administrators, City/County Planning Departments, City Police Departments, City and Rural Fire Departments/Districts and City/County Public Works. However, resources also exist at the state and federal levels. Some of the key agencies in this area include Oregon Emergency Management (OEM), Oregon Building Codes Division (BCD), Oregon Department of Forestry (ODF), Oregon Department of Geology and Mineral Industries (DOGAMI), and the Department of Land Conservation and Development (DLCD).

The Disaster Mitigation Act of 2000 (DMA 2000) is the key federal legislation addressing mitigation planning. It reinforces the importance of mitigation planning and emphasizes planning for natural hazards before they occur. As such, this Act established the Pre-Disaster Mitigation (PDM) grant program and new requirements for the national post-disaster Hazard Mitigation Grant Program (HMGP). Section 322 of the Act specifically addresses mitigation planning at the state and local levels. State and local jurisdictions must have approved mitigation plans in place in order to qualify to receive post-disaster HMGP funds. Mitigation plans must demonstrate that their proposed mitigation measures are based on a sound planning process that accounts for the risks to the individuals and the capabilities of the jurisdictions.

How was the Plan Developed?

The Union County Natural Hazard Mitigation Plan was originally adopted in 2014 by the Steering Committee through assistance from the University of Oregon's Community Service Center Resource Assistance to Rural Environments and the Oregon Partnership for Disaster Resilience (OPDR). For this 2021 update, the County Steering Committee formally convened to discuss and revise the plan. Steering Committee members contributed data, reviewed maps, reviewed and updated the community profile, risk assessment, action items and plan implementation.

The planning process and associated resources used to create the 2014 Union County Natural Hazard Mitigation Plan were developed by OPDR. The planning process was designed to: (1) result in a plan that is DMA 2000 compliant; (2) coordinate with the State's plan and activities of OPDR; and (3) build a network of jurisdictions and organizations that can play an active role in plan implementation.

An open public involvement process is essential to the development of an effective plan. In order to develop a comprehensive approach to reducing the effects of natural disasters, the planning process included an opportunity for the public, neighboring communities, local and regional agencies, and private and non-profit entities to comment on the plan during review. Union County submitted a press release to the La Grande Observer and posted a link of the plan on the county website at www.union-county.org to encourage the public to offer feedback on the update.

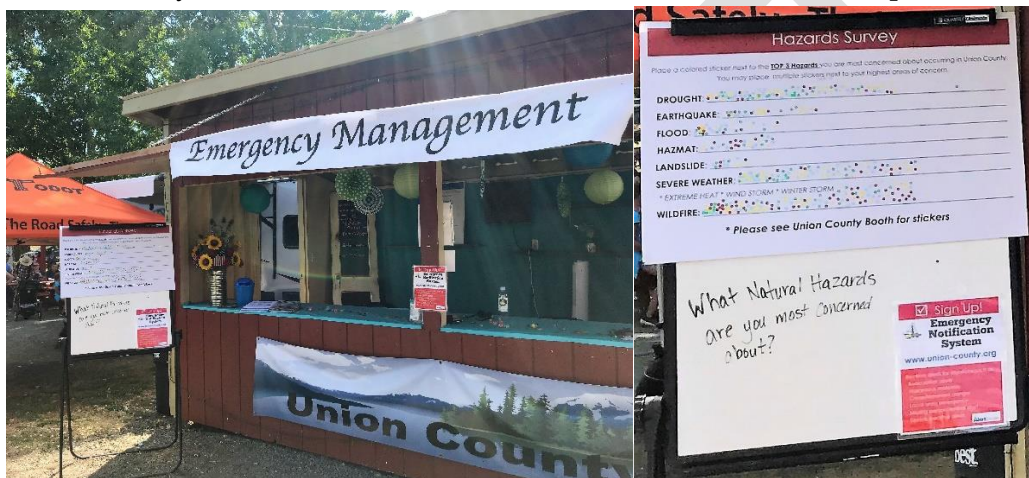
Development of the 2021 Union County Natural Hazard Mitigation Plan Update

As a continuation of the Steering Committee established for the 2014 plan development, the Steering Committee continued to meet semi-annually. The group consists of community leaders and decision-makers who are involved in disaster response and recovery efforts. The various individuals represent the communities and disaster response functions in Union County. The semi-annual meetings are a way to discuss disaster preparedness, planning, mitigation, response, and recovery items of the Natural Hazard Mitigation Plan. The Committee

has facilitated and overseen the 2021 plan update process, as is documented through meeting agendas, rosters, and emails in this document.

Plan Work Sessions

As a first step in the NHMP updating process, a hazards survey was taken involving input from County citizens at the Union County Fair in August, 2019 through participation in graphing their top three hazard concerns in Union County. Hazard options provided included Drought, Earthquake, Flood, Hazmat, Landslide, Wildfire, and Severe Weather to include extreme heat, wind storms and winter storms. Photos of the booth and the graph are provided below. This data, as well as meetings of the Steering Committee, has been utilized in the updating of the Union County Hazards Assessment. This was used as the basis to update the NHMP.



County fair booth and hazard survey – August, 2019

In September of 2019, the Update Project Steering Committee met and determined the next step in the updating process would involve reviewing the existing plan and separating information from the 2014 regional Natural Hazard Mitigation Plan to only include Union County. The original NHMP included Baker, Grant, Union and Wallowa counties as well as the cities of Baker City, Halfway, John Day, La Grande, and Enterprise. Each of the counties in the NHMP determined the plan would be more beneficial if separated into individual counties. The Committee made additional recommendations for updating the plan and identifying tasks for the Emergency Services to address.

Emergency Services and the Update Project Steering Committee met and reviewed the draft plan on March 23, 2021. (see Appendix B). The Committee agreed to review the Action Items and finalize them at the April 27, 2021 meeting.

The draft plan was posted on the Union County website October 15, 2021. The public was invited to submit comments. The draft plan was also sent to Oregon Emergency Management. OEM suggestions will be implemented and then OEM will forward the plan to FEMA for

review and approval. Upon FEMA's pre-approval, the plan will be adopted and approved by the Union County Board of Commissioners.

The City of La Grande has opted to develop their own NHMP, separate from the Union County NHMP. It continues to be under development, but upon completion, will be included in the Annex Section of this Plan.

How is the Plan Organized?

Each volume of the mitigation plan provides specific information and resources to assist readers in understanding the hazard-specific issues facing Union County citizens, businesses, and the environment.

Volume I contains an introduction; community profile; plan mission, goals, and action items; and plan maintenance.

Volume II contains the hazard specific annexes, including:

- Drought
- Earthquake
- Flood
- Landslide
- Wildfire
- Severe Weather to include Dust Storms, Extreme Temperatures, Windstorm, and Winter Storms

Volume III contains resource appendices, including action item forms, planning process documentation, grant programs, economic analysis process, and the plan review guide.

Section 2: Community Profile

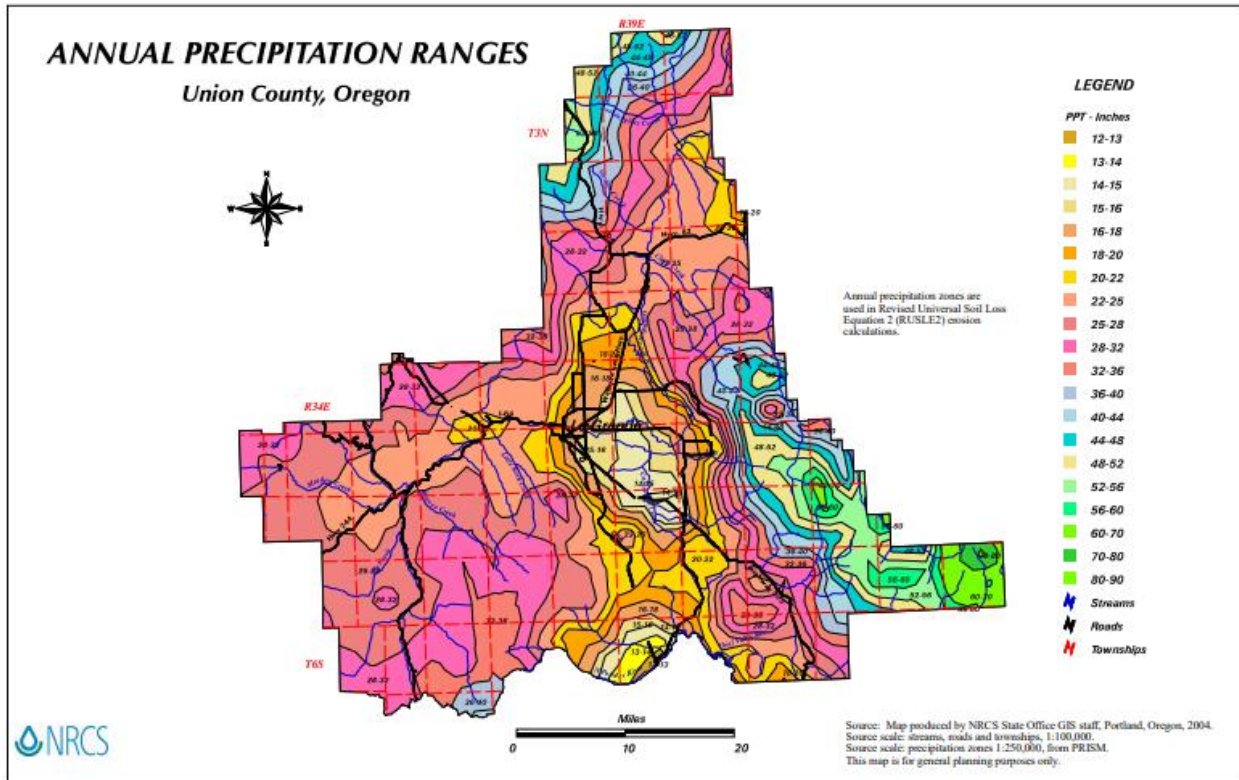
This section describes Union County from a number of perspectives in order to help define and understand their sensitivity and resilience to natural hazards. Sensitivity factors can be defined as those community assets and characteristics that may be impacted by natural hazards, (*e.g.*, special populations, economic factors, and historic and cultural resources). Community resilience factors can be defined as the community's ability to manage risk and adapt to hazard event impacts (*e.g.*, governmental structure, agency missions and directives, and plans, policies, and programs). The information in this section represents a snapshot in time of the current sensitivity and resilience factors in the County when the plan was developed. This information should be used as the local level rationale for the risk reduction actions identified in Section 3 – Mission, Goals, and Action Items.

Geography and Climate

Union County is located along the Interstate 84 corridor in northeast Oregon. The county is situated along the Grande Ronde River and Powder River Valley, taking in the northeastern slopes of the Blue Mountains. Union County is bordered by Wallowa County to the north and east, Baker and Grant Counties to the south and Umatilla County to the West. The Grande Ronde River is a tributary of the Snake River, flowing through southwestern Union County through the Grande Ronde Valley. Union County is part of the Grande Ronde River Basin.

Encompassing 2,038 square miles, the county is bordered by two different mountain ranges. The Eagle Cap Wilderness of the Wallowa Mountains defines the county boundary to the east while the Blue Mountains outline the southern and western sides of the county. The geographic diversity of Union County is an important factor to consider in natural hazard mitigation planning. The highest elevation point lies in the southeastern corner of the county inside the Eagle Cap Wilderness on Glacier Peak at approximately 9,595-foot elevation. The highest elevation outside of the wilderness is Mt. Fanny, due east of La Grande overlooking the valley at approximately 7,125-foot elevation. The vast range of elevation and the valley basin contribute to the wide range of weather received throughout the county. Precipitation is measured in both rainfall and high-elevation snowpack. Annual precipitation data taken from the US Department of Agriculture Natural Resource Conservation Service website shows annual precipitation in the valleys is approximately 14-16 inches, while high mountain precipitations vary with location as shown in Figure I.2.1.

Figure I.2.1: Union County Annual Precipitation



Temperatures in Union County fluctuate greatly between seasons as well as day versus night temperature. Summer temperatures can reach a maximum of more than 100 degrees, with averages of 75-86 degrees from June through August. Winters can be cold and harsh at times with lows dropping below zero, but average temperatures typically range between 20-30 degrees. Winter storms are frequent and severe characterized by low temperatures, high wind velocity, ground saturation, and snowpack. Winter storms can halt traffic, damage power lines, and kill livestock.

**Table I.2.2: Union County (La Grande)
Monthly & Annual Average Temperatures (1971-2000)**

	Monthly Average Temperatures (dg F)	Mean Minimum	Mean Temperature	Extreme Maximum	Extreme Minimum
January	37.3	23.1	30.2	61	-17
February	42.8	26.4	34.6	66	-14
March	50.3	30.5	40.4	75	9
April	57.7	35.1	46.4	88	20
May	66.2	41.8	54	95	25
June	74.9	48.3	61.6	100	29
July	84.7	53	68.9	104	32

August	85	51.8	68.4	104	32
September	75.6	43.5	59.6	100	23
October	62.6	35.4	49	88	13
November	45.6	29.8	37.7	71	-14
December	38.2	24.2	31.2	59	-18
Annual	60.1	36.9	48.5	104	-18

Source: Oregon Climate Service

The physical geography, weather, and climate of an area represent various interrelated systems that affect overall risk and exposure to natural hazards. Climate change variability also has the potential to increase the effects of hazards in the area. These factors combined with periods of population growth and development can lead to increasing risk of hazards, threatening loss of life, property and long-term economic disruption if land management is inadequate.

Population and Demographics

In terms of loss and the ability to recover, disaster impacts vary among population groups following a disaster. To some extent, any individual can be vulnerable to natural hazards but social-science research has demonstrated that demographic factors like age, race, gender, and socioeconomic status can amplify vulnerability, thereby increasing the potential for losses.

The 2019 population estimate for Union County is 26,840. This is a 4% increase from the 25,748 residents in 2010. Table 1.2.3 shows a general trend towards an aging population, with the age category of 65 and over having a larger percentage total of the population in 2018 than in 2011 (+4%).

Table I.2.3: Union County Population by Age

People and Age	
Population estimates, 2019	26,840
Population estimates, 2010	25,748
Population, percent change - 2010 to 2019	4%
Persons under 18 years, 2018	22.8%
Persons under 18 years, 2011	22.7%
Persons 65 years and over, 2018	21.2%
Persons 65 years and over, 2011	17.2%

Source: Population Research Center, Portland State University

Younger populations often require additional direction and assistance in evacuation due to their immaturity and size. Children are also prone to developing post-traumatic stress disorders, depression, anxieties, and behavioral disorders. As shown in Table I.2.3 above, 22.8% of Union County's population is estimated to be between the ages of 0 and 18 remaining fairly consistent between 2011 and 2018. Older populations may also have special needs during and/or after a natural disaster. Research suggests that older populations may require assistance in evacuation due to potential mobility and health issues or reluctance to evacuate.

Additionally, older populations may require special medical equipment at shelters, and are more apt to lack the social and economic resources needed for post-disaster recovery. As shown above, 21.2% of Union County’s population is 65 years or older reflecting an increase in that population group over the past several years.

Race and ethnicity can also influence individual sensitivities and vulnerabilities, and studies have shown that households of racial and ethnic minorities tend to be more vulnerable to extreme natural events. This is not necessarily reflective of individual characteristics; instead, historic patterns of racial and ethnic inequalities may have resulted in minority communities that are more likely to have inferior building stock, infrastructure, and access to public services. Table I.2.4 below provides a population analysis by race.

Minorities that primarily speak a language other than the English can also be more vulnerable to natural disasters. In Union County, 5.1% of the population speaks a language other than English at home, with the language most likely being Spanish.

Table I.2.4: Union County Population by Race

Race	Union County	Oregon
Total Population, 2018	26,461	4,190,713
White	92.6%	86.8%
Black or African American	0.8%	2.2%
American Indian and Alaska Native	1.2%	1.8%
Asian	1.2%	4.8%
Native Hawaiian and Other Pacific Islander	1.3%	0.5%
Two or More Races	2.8%	3.9%
Hispanic or Latino (of any race)	4.9%	13.3%
Not Hispanic or Latino	88.5%	75.3%

Source: US Census QuickFacts Data

Employment and Economics

Economic resilience to natural disasters is particularly important for the major employment sectors in the region. If the region is negatively impacted by a natural hazard, such that employment numbers are reduced, the economic impact will be felt throughout the region.

Table I.2.5: Union County Economic Data

Economy	
In civilian labor force age 16 years+, 2014-2018	57.9%
In civilian labor force, female, age 16 years+, 2010-2014	53%
Total accommodation and food services sales, 2012	\$33,801,000
Total health care and social assistance receipts/revenue, 2012	\$127,539,000
Total manufacturer shipments, 2012	\$275,911,000
Total merchant wholesaler sales, 2012	\$140,291,000
Total retail sales, 2012	\$318,494,000
Total retail sales per capita, 2012	\$12,364
Transportation	
Mean travel time to work, workers age 16 years+, 2014-2018	17.1 minutes
Income and Poverty	
Median household income (in 2018 dollars), 2014-2018	\$48,617
Per capita income in past 12 months (in 2018 dollars), 2014-2018	\$27,425
Persons in poverty, percent	13.9%
Businesses	
Total employer establishments, 2017	748
Total employment, 2017	7,383
Total non-employer establishments, 2017	1,639
All firms, 2012	1,961

Source: US Census QuickFacts Data

Median income can be used as an indicator of the strength of the region's economic stability. In 2014-2018, the median household income in Union County was \$48,617. This was about 19% below the 2014-2018 national median household income of \$60,293. Although median household income can be used to compare areas as a whole, this number does not reflect how income is divided among area residents.

Union County hosts many diverse businesses and employment opportunities. The area is supported by a variety of businesses that contribute toward the local economy with principal industries including agriculture, timber, government, education, and manufacturing. (Oregon State University, 2012).

Grande Ronde Hospital provides medical services in Union County. Founded and opened in 1907 and re-opened at a new location in 1966, the non-profit hospital offers inpatient care as well as a broad range of diagnostic, surgical, and therapeutic outpatient services. The hospital employs more than 700 people.

In 1929, the school that would eventually become Eastern Oregon University (EOU) began holding its first classes at its campus located in La Grande. Including faculty, EOU employs roughly 400 staff and engages over 3,000 students from across the country and globe annually.

The county is also home to a multitude of state and federal agencies that have provided the local area's largest employment opportunities. Out of 10,070 non-farm employment positions, 2,140 are working in transportation, warehousing, and utilities. Another 1,510 are working in

education and health services, with an additional 2,750 employed by the government. (Union County Chamber of Commerce, 2014).

Timber-related employment continues to be an important source of family-wage jobs for the community. Union County currently supports one of the few mill infrastructures in the area, including a plywood mill, particleboard plant, and dimensional lumber mill.

Housing

Housing types and age are important factors in hazard mitigation planning. Certain housing types tend to be less disaster resistant and warrant special attention: mobile homes, for example, are generally more prone to wind and water damage than standard wood-frame construction. Generally, the older the home is, the greater the risk of damage from natural disasters. This is due to stricter building codes that have been developed following improved scientific understanding of plate tectonics and earthquake risk. In Oregon, for example, the building code was only recently (1993) upgraded to include earthquake loading in the building design. As shown in Table I.2.6 below, over 78% of Union County’s housing structures were built before 1990.

Table I.2.6: Union County Housing Age

Year	Number	Percent
2014 or later	138	1.2%
2010-2013	254	2.2%
2000-2009	903	7.7%
1990-1999	1,240	10.6%
1980-1989	1,283	11%
1970-1979	2,659	22.8%
1960-1969	914	7.8%
1950-1959	817	7%
1940-1949	627	5.4%
1939 or earlier	2,849	24.4%
Total	11,684	100%

Source: U.S. Census, 2008 American Community Survey

Table I.2.7: Union County Units and Costs

Housing	
Housing units, 2018	11,833
Housing units, 2010	
Owner-occupied housing unit rate, 2014-2018	64.1%
Median value of owner-occupied housing units, 2014-2018	\$181,800
Median selected monthly owner costs -with mortgage, 2014-2018	\$1,193
Median selected monthly owner costs -without mortgage, 2014-2018	\$433
Median gross rent, 2014-2018	\$795

Land Use and Development

Union County was founded October 14, 1864. The county is named for the town of Union located within Union County. The choice of a county seat resulted in competition, based on geography and on economic and population growth, between La Grande and the City of Union. The county seat alternated between Union and La Grande until it permanently came to rest in La Grande in 1905.

Union County consists of eight incorporated cities, which include Cove, Elgin, Imbler, Island City, La Grande, North Powder, Summerville, and Union. About 26,835 people reside within the incorporated cities of Union County based on 2019 population estimates. The principal population area is the City of La Grande with a population of approximately 13,000.

Union County's economy has historically been based on timber and agriculture. This has impacted the land use and development patterns in the County. Three-fourths of the County is forested, but over one half of that is publicly owned.

Critical Infrastructure and Facilities

Transportation networks, systems for power transmission and delivery, fiber optic lines and critical facilities such as hospitals, police stations and other government infrastructure are all vital to the functioning of the region. Due to the fundamental role that infrastructure plays both pre-and post-disaster, it deserves special attention in the context of creating more resilient communities. The information documented in this section of the profile can provide the basis for informed decisions about how to reduce the vulnerability of Union County's infrastructure to natural hazards.

Transportation routes within Union County include the Interstate-84 freeway; Highway 82 which connects La Grande to Island City, Imbler, Summerville, and Elgin; Highway 203 which connects La Grande to Union; and Highway 237 which connects Union, Cove, North Powder and La Grande. Possible transportation options other than those involving a personal vehicle include Greyhound Bus Lines and the Union County general aviation airport. There is also a limited route of public transportation within the City of La Grande that is operated by Community Connections of NE Oregon.

Critical facilities are those facilities that are essential to government response and recovery activities. These facilities include local police and fire stations, public works facilities, sewer and water facilities, hospitals, state and federal government buildings and shelters. Table I.2.8 provides a list of some of Union County's critical facilities and structures.

Table I.2.8: Critical Facilities in Union County

Facility	Number
Hospital (beds)	1 (25)
Police Stations	1
Fire & Rescue	7
Power Plants	0
Dams	17
Bridges	161

Source: Upper Grande Ronde River Watershed Partnership Place-Based Integrated Water Resources Planning State of Water Resources Report, Grande Ronde Hospital, Statesman Journal: Bridge Inspections, Union County

Historical and Cultural Resources

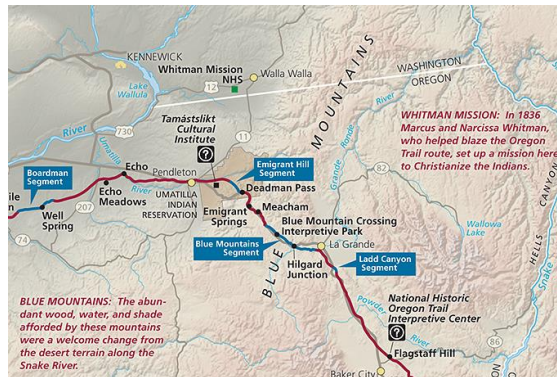
Historic and cultural resources such as historic structures and landmarks can help to define a community and may also be sources of tourism dollars. Because of their role in defining and supporting the community, protecting these resources from the impact of disasters is important.

The following structures and/or places within Union County are listed on the National Register of Historic Places:

Ascension Episcopal Church and Rectory	Cove
Elgin City Hall and Opera House	Elgin
Eastern Oregon University Administration Building	La Grande
Anthony, John (House)	La Grande
Anthony-Buckley (House)	La Grande
Foley Building	La Grande
Hot Lake Resort	La Grande
La Grande Commercial Historic District	La Grande
La Grande Neighborhood Club	La Grande
Roesch Building	La Grande
Slater Building	La Grande
Stange, August J. (House)	La Grande
U.S. Post Office and Federal Building	La Grande
Liberty Theater	La Grande
Hudelson, A.B. and Son (Building)	North Powder
Dry Creek School	Summerville
Eaton, Abel E. (House)	Union
Townley, W. J. (House)	Union
Union Main Street Historic District	Union

Source: National Park Service, National Register of Historic Places

The following map represents a portion of the historic Oregon Trail. This trail, which travels diagonally through Union County, covers several county miles. Historic landmarks are placed at multiple locations on the trail.



Source: <https://www.nps.gov/oreg/planyourvisit/maps.htm>

Government Structure

Union County has three elected County Commissioners, as well as an elected Sheriff, District Attorney, Treasurer, Clerk, Assessor, and Surveyor. The Board of Commissioners oversees county activities, departments, and budgets.

Existing Plan & Policies

Union County has existing plans and policies that guide and influence land use, land development, and population growth. Plans and policies already in existence have support from local residents, businesses and policy makers. Many land-use, comprehensive, and strategic plans get updated regularly, and can adapt easily to changing conditions and needs.

The Union County Natural Hazard Mitigation Plan includes a range of recommended action items that, when implemented, will reduce vulnerability to natural hazards. Many of these recommendations are consistent with the goals and objectives of existing plans and policies. Implementing the NHMP's action items through existing plans and policies increases their likelihood of being supported, updated, and maximizes resources.

Union County's current plans and policies include the following:

Planning Documents for Union County			
Jurisdiction	Document	Year Acknowledged	Last Revision
Union County	Natural Resource Plan	Not finalized - anticipate completion in 2021	
Union County	Place-based Water Resource Plan	Not finalized - anticipate completion in 2021	
Union County	Community Wildfire Protection Plan		2017
Union County	Zoning, Partition and Subdivision Ordinance		1983
Union County	Transportation System Plan		1999
Union County	Comprehensive Land Use Plan		1978
Union County	Flood Insurance Study		1996
Union County	Grande Ronde Sub-basin Plan		2004
Cove	Comprehensive Land Use Plan	1984	1984
Cove	Zoning Ordinance		1984
Elgin	Comprehensive Plan	1984	
Imbler	Comprehensive Plan	1981	1981
Imbler	Zoning Ordinance		1993
Island City	Comprehensive Plan	1984	2001
Island City	Zoning Ordinance		2001
La Grande	Comprehensive Plan	1984	2013
La Grande	Land Development Code		2021
La Grande	Morgan Lake Study		2013
La Grande	Transportation System Plan		1999
North Powder	Comprehensive Plan	1983	1983
Union City	Comprehensive Plan	1981	1981

Community Organizations and Programs

Social systems can be defined as community organizations and programs that provide social and community-based services, such as health care or housing assistance, to the public. In planning for natural hazard mitigation, it is important to know what social systems exist within the community because of their existing connections to the public. Often, actions identified by the plan involve communicating with the public or specific subgroups within the population (e.g. elderly, children, low income). The county can use existing social systems as resources for implementing such communication-related activities because these service providers already work directly with the public on a number of issues, one of which could be natural hazard preparedness and mitigation.

The following table highlights organizations that are active within the community and may be potential partners for implementing mitigation actions. The table includes information on each organization or program's service area, types of services offered, and populations served. These organizations can assist with:

- Education and outreach – organizations could partner with the community to educate the public or provide outreach assistance on natural hazard preparedness and mitigation.
- Information dissemination – organizations could partner with the community to provide hazard-related information to target audiences.
- Plan/project implementation – organizations may have plans and/or policies that may be used to implement mitigation activities or the organization could serve as the coordinating or partner organization to implement mitigation actions.

Name and Contact Information	Description	Service Area	Populations Served					
			Businesses	Children	Disabled	Elders	Families	Low Income
Grande Ronde Hospital 900 Sunset Drive La Grande, Oregon (541) 963-8421	Grande Ronde Hospital is a place where children, families and other adults in the community can come for medical care.	Union County	x	x	x	x	x	x
La Grande Fire Department 1806 Cove Avenue La Grande, Oregon (541) 963-3123	Protect lives and property of citizens. ALS Ambulance for County. Respond to medical emergencies, vehicular accidents, rescue calls.	Portions of Union County	x	x	x	x	x	x
La Grande Rural Fire Protection District 10200 S McAlister Rd Island City, Oregon (541) 963-6895	Prevent loss of life and property. Respond to medical emergencies, vehicular accidents, rescue calls	Portions of Union County	x	x	x	x	x	x
Imbler Rural Fire Protection District 160 Ruckman Avenue Imbler, Oregon (541) 534-6351	Prevent loss of life and property. Respond to medical emergencies.	Portions of Union County	x	x	x	x	x	x
Cove Rural Fire Protection District 607 Main Street Cove, Oregon (541) 568-7734	Prevent loss of life and property. Respond to medical emergencies.	Portions of Union County	x	x	x	x	x	x
Elgin Rural Fire Protection District 900 Alder Street Elgin, Oregon (541) 437-1828	Prevent loss of life and property. Respond to medical emergencies.	Portions of Union County	x	x	x	x	x	x
Elgin Ambulance 180 S 8 th Avenue Elgin, Oregon (541) 437-2253	Provide critical care transportation to patients	Portions of Union County	x	x	x	x	x	x
North Powder Rural Fire Protection District 320 E Street North Powder, Oregon (541) 898-2520	Prevent loss of life and property. Respond to medical emergencies.	Portions of Union County	x	x	x	x	x	x
Union Ambulance 342 S Main Union, Oregon (541) 562-5197	Provide critical care transportation to patients	Portions of Union County	x	x	x	x	x	x

Union Rural Fire Protection District 570 E Beakman Street Union, Oregon (541) 562-5758	Prevent loss of life and property. Respond to medical emergencies.	Portions of Union County	x	x	x	x	x	x
Union County Chamber of Commerce 102 Elm Street La Grande, Oregon (541) 963-8588	Provide economic development and assistance to local businesses.	Union County	x					
LifeFlight Network 60191 Pierce Road La Grande, Oregon (541) 663-8015	Provide critical care transportation to patients	Union County	X	X	X	X	X	X

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Section 3: Mission, Goals, and Action Items

This section describes the components that guide implementation of the identified mitigation strategies and is based on strategic planning principles. Information is provided on the process used to develop a mission, goals and action items. It also includes an explanation of how Union County intends to incorporate the mitigation strategies outlined in the plan into existing planning mechanisms and programs such as the comprehensive land use planning process, capital improvement planning process, and building codes enforcement and implementation.

Mitigation Plan Mission

The mission of the Union County NHMP is intended to be adaptable with any future updates to the plan. The Northeast Oregon Multi-Jurisdictional National Hazard Mitigation Plan Committee developed the following mission statement:

To create a disaster-resilient Northeast Oregon

The 2021 Steering Committee changed it to the following:

To create a disaster-resilient and self-reliant County

Mitigation Plan Goals

The plan goals help guide the direction of future activities aimed at reducing risk and preventing loss from natural hazards. The goals listed here serve as checkpoints as agencies and organizations begin implementing mitigation action items. The goals of the Union County NHMP are to:

1. Protect human welfare, property, and natural resources.
2. Increase the resilience of local and regional economies
3. Motivate mitigation activity against the effects of natural hazards through education, outreach, and awareness
4. Strengthen organizational and community capacity

Mitigation Plan Action Items

Short and long-term action items identified through the planning process are an important part of the mitigation plan. Action items are detailed recommendations for activities that local departments, citizens and others could engage in to reduce risk. They address both multi-hazard and hazard-specific issues. Action items can be developed through a number of sources. A description of how the plan's mitigation actions were developed is provided below.

Each action item has a corresponding action item worksheet describing the activity, identifying the rationale for the project, identifying potential ideas for implementation, and assigning coordinating and partner organizations. The action item worksheets can assist the community in pre-packaging potential projects for grant funding. The worksheet components are described below. These action item worksheets are located in Appendix A.

The Steering Committee developed the action items presented in this plan based upon local vulnerability information, stakeholder interviews, and an analysis of local plans and reports. The action items also include deferred actions from the 2014 mitigation plan. During the update process, the Steering Committee identified which actions from the 2014 plan had been completed or not completed, and which should be included in the 2021 update.

Rationale or Key Issues Addressed

Action items should be fact-based and tied directly to issues or needs identified throughout the planning process. Action items can be developed at any time during the planning process and can come from a number of sources, including participants in the planning process, noted deficiencies in local capability, or issues identified through the risk assessment. The rationale for proposed action items is based on the information documented in Section 2 and the Hazard Annexes.

Ideas for Implementation

The ideas for implementation offer a transition from theory to practice and serve as a starting point for this plan. This component of the action item is dynamic, since some ideas may prove to not be feasible, and new ideas may be added during the plan maintenance process. Ideas for implementation include such things as collaboration with relevant organizations, grant programs, tax incentives, human resources, education and outreach, research, and physical manipulation of buildings and infrastructure.

Implementation through Existing Programs

The Union County NHMP includes a range of action items that, when implemented, will reduce loss from hazard events in Union County. Within the plan, FEMA requires the identification of existing programs that might be used to implement these action items. Union County currently addresses statewide planning goals and legislative requirements through its comprehensive land use plan, capital improvements plan, mandated standards and building codes. To the extent possible, Union County will work to incorporate the recommended mitigation action items into existing programs and procedures.

Coordinating Organization

The coordinating organization is the public agency with the regulatory responsibility to address natural hazards, or that is willing and able to organize resources, find appropriate funding, or oversee activity implementation, monitoring and evaluation.

Internal and External Partners

The internal and external partner organizations listed in the Action Item Worksheets are potential partners recommended by the project Steering Committee but not necessarily contacted during the development of the plan. The coordinating organization should contact the identified partner organizations to see if they are capable of and interested in participation. This initial contact is also to gain a commitment of time and/or resources toward completion of the action items.

Internal partner organizations are departments within the County or other participating jurisdictions that may be able to assist in the implementation of action items by providing relevant resources to the coordinating organization.

External partner organizations can assist the coordinating organization in implementing the action items in various functions and may include local, regional, state, or federal agencies, as well as local and regional public and private sector organizations.

Plan Goals Addressed

The plan goals addressed by each action item are identified as a means for monitoring and evaluating how well the mitigation plan is achieving its goals, following implementation.

Timeline

Action items include both short and long-term activities. Each action item includes an estimate of the timeline for implementation. *Short-term action items* (ST) are activities that may be implemented with existing resources and authorities in one to two years. *Long-term action items* (LT) may require new or additional resources and/or authorities, and may take from one to five years to implement.

Section 4: Plan Implementation and Maintenance

Union County will submit the 2021 NHMP update to the State Hazard Mitigation Officer at Oregon Emergency Management. Oregon Emergency Management submits the plan to the Federal Emergency Management Agency (FEMA–Region X) for review. This review addresses the federal criteria outlined in the FEMA Interim Final Rule 44 CFR Part 201. Upon pre-approval by FEMA, Union County will adopt the plan via resolution. At that point the County will gain eligibility for the Pre-Disaster Mitigation Grant Program, the Hazard Mitigation Grant Program funds, and Flood Mitigation Assistance program funds.

Implementing the Plan

Convener

The Union County Emergency Manager is the Chair of the Union County Natural Hazard Mitigation Plan Committee and serves as the convener for this plan. The convener’s responsibilities include:

- Coordinating Steering Committee meetings, dates, times, locations, agendas, and member notification;
- Documenting the discussions and outcomes of committee meetings;
- Serving as a communication conduit between the Steering Committee and the public stakeholders;
- Identifying emergency management-related funding sources for natural hazard mitigation projects;
- Coordinating plan update processes (to include review of the risk assessment, goals, action items, and plan implementation and maintenance strategies);
- Submitting future plan updates to Oregon Emergency Management for review; and
- Coordinating the local adoption process.

Steering Committee

The coordinating body for this plan is the Steering Committee, which includes the following:

Steering Committee	
American Red Cross	Heather Stanhope
Avista Natural Gas	Greg Ford
Center for Human Development	George Thompson
City of Union Administrator	Doug Wiggins
Cove Public Works Director	Dave Johnson
Elgin School District	Dianne Greif
Grande Ronde Hospital	April Brock
Imbler Fire Chief	Mike Barry

La Grande City Manager	Robert Strope
La Grande Chief of Police	Gary Bell
La Grande Fire Chief	Emmitt Cornford
La Grande Public Works Director	Kyle Carpenter
La Grande Rural Fire Chief	Craig Kretschmer
Oregon Department of Forestry	Logan McCrae
Oregon Department of Forestry	Mitch Williams
Oregon Department of Transportation	Sean Rohan
Union County Emergency Manager	Nick Vora
Union County Emergency Services	Annette Powers
Union County Sheriff	Cody Bowen
Union County Soil & Water Conservation District	Jim Webster
Ziply Fiber	Diana Anderson

Roles and responsibilities of the Steering Committee include:

- Serving as the local evaluation committee for funding programs such as the Pre- Disaster Mitigation Grant Program, the Hazard Mitigation Grant Program funds, and Flood Mitigation Assistance program funds;
- Prioritizing and recommending funding for natural hazard risk reduction projects;
- Documenting successes and lessons learned;
- Evaluating and updating the Natural Hazard Mitigation Plan following a disaster;
- Evaluating and updating the Natural Hazard Mitigation Plan in accordance with the prescribed maintenance schedule; and
- Developing and coordinating ad hoc and/or standing subcommittees as needed.
- Engage additional stakeholders in order to make the Union County NHMP as broad and useful as possible.

Plan Maintenance

The Union County Natural Hazard Mitigation Plan Steering Committee is responsible for implementing this process, in addition to maintaining and updating the plan through a series of meetings outlined in the maintenance schedule below.

Bi-Annual Meetings

The Steering Committee will meet at least semi-annually to complete the following tasks:

- Review existing action items to determine appropriateness for funding
- Educate and train new members on the plan and mitigation in general
- Identify issues that may not have been identified when the plan was developed
- Prioritize potential mitigation projects using the methodology described below:
 - Review existing and new risk assessment data

- Discuss methods for continued public involvement
- Document successes and lessons learned during the year

The convener will be responsible for documenting the outcome of meetings in Appendix B.

The plan format allows the County and participating jurisdictions to review and update sections when new data becomes available. New data can be easily incorporated, resulting in a natural hazard mitigation plan that remains current and relevant to the participating jurisdictions.

Project Prioritization Process

The Disaster Mitigation Act of 2000 requires that jurisdictions identify a process for prioritizing potential actions. Potential mitigation activities often come from a variety of sources; therefore, the project prioritization process needs to be flexible. Projects may be identified by Steering Committee members, local government staff, other planning documents, or the risk assessment.

The following is an Action Item and Project Prioritization Review Process.

Step 1: Examine funding requirements

The first step in prioritizing the plan's action items is to determine which funding sources are open for application. Several funding sources may be appropriate for the county's proposed mitigation projects. Examples of mitigation funding sources include but are not limited to: FEMA's Pre-Disaster Mitigation competitive grant program (PDM), Flood Mitigation Assistance (FMA) program, Hazard Mitigation Grant Program (HMGP), National Fire Plan (NFP), Community Development Block Grants (CDBG), local general funds, and private foundations, among others. Please see Appendix C Grant Programs for a more comprehensive list of potential grant programs.

Because grant programs open and close on differing schedules, the coordinating body will examine upcoming funding streams' requirements to determine which mitigation activities would be eligible. The coordinating body may consult with the funding entity, Oregon Emergency Management, or other appropriate state or regional organizations about project eligibility requirements. This examination of funding sources and requirements will happen during the coordinating body's semi-annual plan maintenance meetings.

Step 2: Complete risk assessment evaluation

The second step in prioritizing the plan's action items is to examine which hazards the selected actions are associated with and where these hazards rank in terms of community risk. The coordinating body will determine whether or not the plan's risk assessment supports the implementation of eligible mitigation activities. This determination will be based on the location of the potential activities, their proximity to known hazard areas, and whether community assets are at risk. The coordinating body will additionally consider whether the

selected actions mitigate hazards that are likely to occur in the future, or are likely to result in severe / catastrophic damages.

Step 3: Steering Committee Recommendation

Based on the steps above, the Steering Committee will recommend which mitigation activities should be moved forward. If the Steering Committee decides to move forward with an action, the coordinating organization designated on the action item form will be responsible for taking further action and, if applicable, documenting success upon project completion. The Steering Committee will convene a meeting to review the issues surrounding grant applications and to share knowledge and/or resources. This process will afford greater coordination and less competition for limited funds.

Step 4: Complete quantitative and qualitative assessment, and economic analysis

The fourth step is to identify the costs and benefits associated with the selected natural hazard mitigation strategies, measures or projects. Two categories of analysis that are used in this step are: (1) benefit/cost analysis, and (2) cost-effectiveness analysis.

Conducting benefit/cost analysis for a mitigation activity assists in determining whether a project is worth undertaking now, in order to avoid disaster-related damages later. Cost-effectiveness analysis evaluates how best to spend a given amount of money to achieve a specific goal. Determining the economic feasibility of mitigating natural hazards provides decision makers with an understanding of the potential benefits and costs of an activity, as well as a basis upon which to compare alternative projects.

If the activity requires federal funding for a structural project, the Steering Committee will use a Federal Emergency Management Agency-approved cost-benefit analysis tool to evaluate the appropriateness of the activity. A project must have a benefit/cost ratio of greater than one in order to be eligible for FEMA grant funding.

For non-federally funded or nonstructural projects, a qualitative assessment will be completed to determine the project's cost effectiveness. The Steering Committee will use a multivariable assessment technique called STAPLE/E to prioritize these actions.

STAPLE/E stands for Social, Technical, Administrative, Political, Legal, Economic, and Environmental. Assessing projects based upon these seven variables can help define a project's qualitative cost effectiveness. The STAPLE/E technique has been tailored for use in natural hazard action item prioritization by the Partnership for Disaster Resilience at the University of Oregon's Community Service Center. See Appendix D for a description of the STAPLE/E evaluation methodology.

Continued Public Involvement & Participation

The participating jurisdictions are dedicated to involving the public directly in the helping to reshape and update the Union County NHMP. Although members of the Steering Committee represent the public to some extent, the public has also been invited to comment on the plan. The public will also be encouraged to participate during the implementation process to help refine the plan as needed between formal updates.

To ensure that these opportunities will continue, Union County will post the plan on its website, allowing the public to have easy online access to the plan. The public will also be informed when meetings discussing the plan are held.

On an annual basis the Steering Committee will utilize the “Local Plan Review Guide” to verify the continued relevance of the plan. See Volume III, Appendix E.

Five-Year Review of Plan

This plan will be updated every five years in accordance with the update schedule outlined in the Disaster Mitigation Act of 2000. The Union County Natural Hazard Mitigation Plan is due to be updated on or before 2026. The convener will be responsible for organizing the coordinating body to address plan update needs. The coordinating body will be responsible for updating any deficiencies found in the plan, and for ultimately meeting the Disaster Mitigation Act of 2000’s plan update requirements.

The following Mitigation Plan Update Toolkit, as well as the Local Plan Review Guide found in Volume III, Appendix E, can assist the convener in determining which plan update activities can be discussed during regularly-scheduled plan maintenance meetings, and which activities require additional meeting time and/or the formation of sub-committees.

Mitigation Plan Update Toolkit			
<i>Question</i>	<i>Yes</i>	<i>No</i>	<i>Plan Update Action</i>
Is the planning process description still relevant?	X		Modify this section to include a description of the plan update process. Document how the planning team reviewed and analyzed each section of the plan, and whether each section was revised as part of the update process. (This toolkit will help you do that).
Do you have a public involvement strategy for the plan update process?	X		Decide how the public will be involved in the plan update process. Allow the public an opportunity to comment on the plan process and prior to plan approval.
Have public involvement activities taken place since the plan was adopted?	X		Document activities in the “planning process” section of the plan update
Are there new hazards that should be addressed?		X	Add new hazards to the risk assessment section
Have there been hazard events in the community since the plan was adopted?	X		Document hazard history in the risk assessment section
Have new studies or previous events identified changes in any hazard’s location or extent?		X	Document changes in location and extent in the risk assessment section
Has vulnerability to any hazard changed?		X	Document changes in vulnerability in the risk assessment section
Have development patterns changed? Is there more development in hazard prone areas?		X	
Do future annexations include hazard prone areas?		X	
Are there new high-risk populations?		X	
Are there completed mitigation actions that have decreased overall vulnerability?		X	

Mitigation Plan Update Toolkit

<i>Question</i>	<i>Yes</i>	<i>No</i>	<i>Plan Update Action</i>
Did the plan document and/or address National Flood Insurance Program repetitive flood loss properties?	X		There are no repetitive losses.
Did the plan identify the number and type of existing and future buildings, infrastructure, and critical facilities in hazards areas?	X		1) Update existing data in risk assessment section or 2) determine whether adequate data exists. If so, add information to plan. If not, describe why this could not be done at the time of the plan update
Did the plan identify data limitations?	X		If yes, the plan update must address them: either state how deficiencies were overcome or why they couldn't be addressed
Did the plan identify potential dollar losses for vulnerable structures?	X		1) Update existing data in risk assessment section or 2) determine whether adequate data exists. If so, add information to plan. If not, describe why this could not be done at the time of the plan update
Are the plan goals still relevant?	X		Document any updates in the plan goal section
What is the status of each mitigation action?	X		Document whether each action is completed or pending. For those that remain pending explain why. For completed actions, provide a 'success' story.
Are there new actions that should be added?		X	Add new actions to the plan. Make sure that the mitigation plan includes actions that reduce the effects of hazards on both new and existing buildings.
Is there an action dealing with continued compliance with the National Flood Insurance Program?	X		If not, add this action to meet minimum NFIP planning requirements

Are changes to the action item prioritization, implementation, and/or administration processes needed?		X	Document these changes in the plan implementation and maintenance section
Do you need to make any changes to the plan maintenance schedule?		X	Document these changes in the plan implementation and maintenance section
Is mitigation being implemented through existing planning mechanisms (such as comprehensive plans, or capital improvement plans)?	X		If the community has not made progress on process of implementing mitigation into existing mechanisms, further refine the process and document in the plan.

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Volume II: Hazard Annexes

Introduction

The foundation of the Union County NHMP is the risk assessment. Risk assessments provide information about the areas where the hazards may occur, the value of existing land and property in those areas, and an analysis of the potential risk to life, property, and the environment that may result from natural hazard events.

This section identifies and profiles the location, extent, previous occurrences, and future probability of natural hazards that can impact the participating jurisdictions. The information in this section was paired with the information in Section 2 - Community Profile during the planning process in order to identify issues and develop actions aimed at reducing overall risk, or the area of overlap in the figure below.

This section drills down to local level information and results in an understanding of the risks the communities face. In addition to local data, the information here relies upon the Regional Risk Assessment in the State Natural Hazard Mitigation.

What is a Risk Assessment?

A risk assessment consists of three phases: hazard identification, vulnerability assessment, and risk analysis.

The first phase, hazard identification, involves the identification of the geographic extent of a hazard, its intensity, and its probability of occurrence. This level of assessment typically involves producing a map. The outputs from this phase can also be used for land use planning, management, and regulation; public awareness; defining areas for further study; and identifying properties or structures appropriate for acquisition or relocation.

The second phase, vulnerability assessment, combines the information from the hazard identification with an inventory of the existing (or planned) property and population exposed to a hazard, and attempts to predict how different types of property and population groups will be affected by the hazard. This step can also assist in justifying changes to building codes or development regulations, property acquisition programs, policies concerning critical and public facilities, taxation strategies for mitigating risk, and informational programs for members of the public who are at risk.

The third phase, risk analysis, involves estimating the damage, injuries, and costs likely to be incurred in a geographic area over a period of time. Risk has two measurable components: (1) the magnitude of the harm that may result, defined through the vulnerability assessment, and (2) the likelihood or probability of the harm occurring. An example of a product that can assist

communities in completing the risk analysis phase is HAZUS, a risk assessment software program for analyzing potential losses from floods, hurricane winds and earthquakes. In HAZUS-MH current scientific and engineering knowledge is coupled with the latest geographic information systems (GIS) technology to produce estimates of hazard-related damage before, or after a disaster occurs.

This three-phase approach to developing a risk assessment should be conducted sequentially because each phase builds upon data from prior phases. However, gathering data for a risk assessment need not occur sequentially.

Probability and Vulnerability Assessments

The hazard annexes in Volume II describe each hazard's probability of future occurrence within Union County as well as the county's overall vulnerability to each hazard. To facilitate connections with the State of Oregon's Natural Hazard Mitigation Plan, this plan uses the same rating scales as provided within Oregon Emergency Management's Hazard Analysis Methodology template, and are listed below. Probability estimates are based on the frequency of previous events, and vulnerability estimates are based on potential impacts of the hazard to Union County. Each hazard analysis, developed from a Federal Emergency Management Agency (FEMA) tool that has been refined by the Oregon Military Department - Office of Emergency Management (OEM), addresses and weights (shown as percent within parentheses) probability (29%), vulnerability (21%), maximum threat (42%) and the history (8%) of each natural hazard and attributes a final hazard analysis score. The methodology produces scores that range from 24 to 240. For local governments, conducting the hazard analysis is a useful step in planning for hazard mitigation. The method provides the jurisdiction with a relative ranking from which to prioritize mitigation strategies, but does not predict the occurrence of a particular hazard. Provided below are brief descriptions of each category:

Probability is the likelihood of future occurrence within a specified period of time.
LOW = one incident likely within 75 to 100 years scores between 1 and 3 points
MEDIUM = one incident likely within 35 to 75 years scores between 4 and 7 points
HIGH = one incident likely within 10 to 35 years scores between 8 and 10 points

Vulnerability includes the percentage of population and property likely to be affected under an "average" occurrence of the hazard.

LOW = less than 1% affected scores between 1 and 3 points
MEDIUM = between 1 and 10% affected scores between 4 and 7 points
HIGH = more than 10% affected scores between 8 and 10 points

Maximum threat is the highest percentage of population and property that could be impacted under a worst-case scenario.

LOW - score at 1 to 3 points based on... < 5% affected
MEDIUM - score at 4 to 7 points based on... 5 - 25% affected

HIGH - score at 8 to 10 points based on... > 25% affected

History is the record of previous occurrences.

LOW - score at 1 to 3 points based on... 0 - 1 event past 100 years

MEDIUM - score at 4 to 7 points based on... 2 - 3 events past 100 years

HIGH - score at 8 to 10 points based on... 4 or more events past 100 years

The probability and vulnerability scores in each hazard annex are taken from the 2021 Union County Hazard Analysis. Scores were reviewed by the Union County Steering Committee members during the plan update process.

Hazard scores listed in this plan are based upon an analysis of risk conducted by the Union County Emergency Manager and the Natural Hazard Mitigation Steering Committee. Table I.1.2 below summarizes the hazard probability and vulnerability scores for Union County.

Table I.1.2: Risk Assessment Summary

Hazard	Vulnerability	Probability
Severe Winter Weather	40 - High	56 - High
Flood	25 - Moderate	42 - High
Earthquake	35 - High	14 - Low
Wildfire	25 - Moderate	35 - Moderate
Drought	25 - Moderate	35 - Moderate
Extreme Heat	25 - Moderate	35 - Moderate
Windstorm/Tornado	20 - Low	35 - Moderate
Dust Storm	20 - Low	28 - Low
Dam Failure	15 - Low	14 - Low
Landslide	15 - Low	21 - Low

Source: Union County NHMP Risk Assessment

Drought

Causes and Characteristics of the Hazard

Drought can be defined in several ways. The American Heritage Dictionary defines drought as “a long period with no rain, especially during a planting season.” The National Drought Mitigation Center and the National Center for Atmospheric Research further define the hazard by categorizing it according to the “type of drought.” These types include the following:

Meteorological or Climatological Droughts

Meteorological droughts are defined in terms of the departure from a normal precipitation pattern and the duration of the event. These droughts are a slow-onset phenomenon that can take at least three months to develop and may last for several seasons or years.

Agricultural Droughts

Agricultural droughts link the various characteristics of meteorological drought to agricultural impacts. The focus is on precipitation shortages and soil-water deficits. Agricultural drought is largely the result of a deficit of soil moisture. A plant’s demand for water is dependent on prevailing weather conditions, biological characteristics of the specific plant, its stage of growth, and the physical and biological properties of the soil.

Hydrological Droughts

Hydrological droughts refer to deficiencies in surface water and sub-surface water supplies. It is measured as stream flow, and as lake, reservoir, and ground water levels. Hydrological measurements are not the earliest indicators of drought. When precipitation is reduced or deficient over an extended period of time, the shortage will be reflected in declining surface and sub-surface water levels.

Socioeconomic Droughts

Socioeconomic droughts occur when physical water shortage begins to affect people, individually and collectively. Most socioeconomic definitions of drought associate it with supply, demand, and economic goods. One could argue that a physical water shortage with no socio-economic impacts is a policy success.

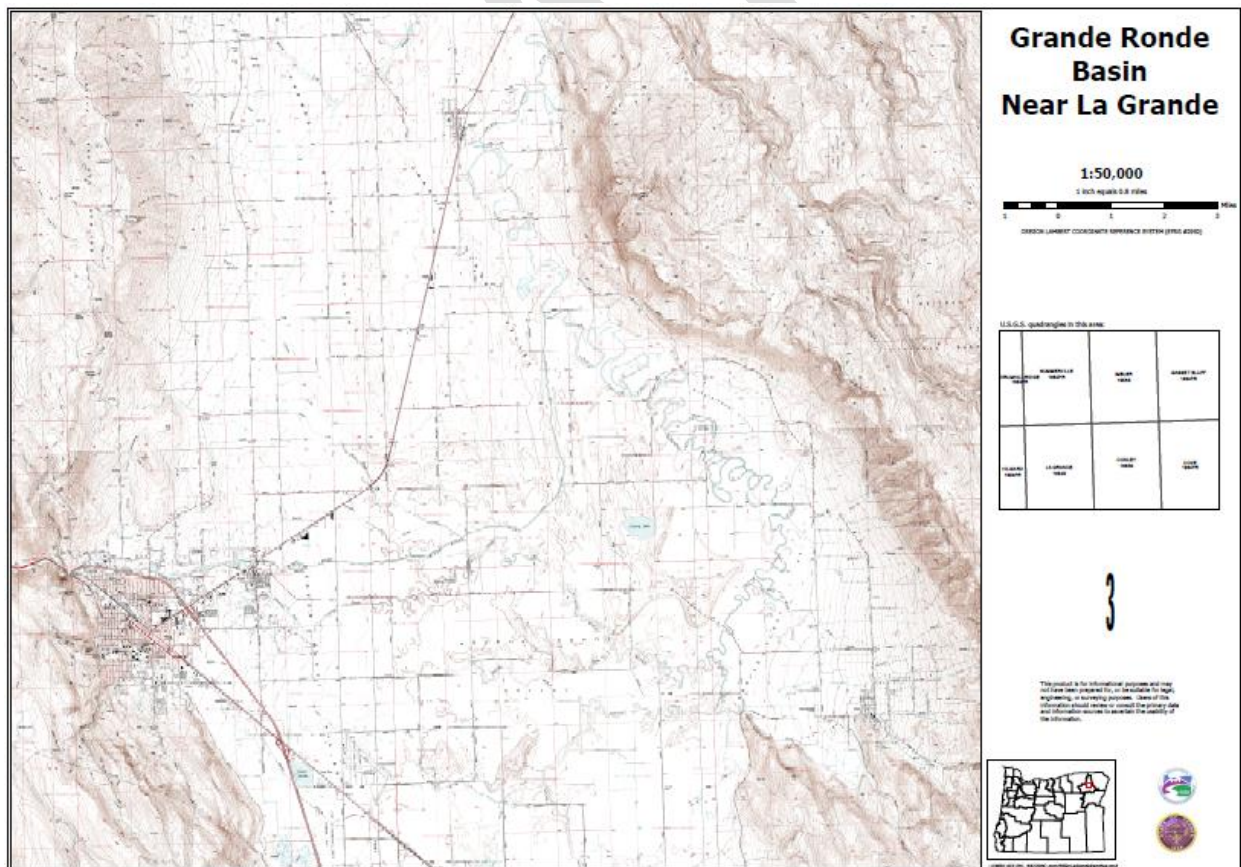
Drought is typically measured in terms of water availability in a defined geographical area. It is common to express drought with a numerical index that ranks severity. The Palmer Drought Severity Index is the most commonly used drought measurement in the state because it incorporates both local conditions and mountain snow pack. The Palmer Drought Severity Index categorizes droughts as mild, moderate, severe, and extreme.

The Water Availability Committee utilizes the Surface Water Supply Index (SWSI) to derive the Oregon Drought Severity Index that is reported to the Drought Council. The SWSI is an index of current water conditions throughout the state. The index utilizes parameters derived from snow, precipitation, reservoir, and streamflow data. The data is gathered each month from key stations in each basin. The lowest SWSI value, -4.1, indicates extreme drought conditions. The highest SWSI value, +4.1, indicates extreme wet conditions. The mid-point is 0.0, which indicates a normal water supply.

Northeast Oregon Watershed Basins

The Water Resources Commission determines the policies and procedures for the use and control of the state’s water resources. The watershed basins are controlled and administered partially by basin programs which establish water management policies and objectives for the use and appropriation of the surface and ground water within each of the respective basins. The Water Resources Commission has adopted programs for the Grande Ronde Basin which can be seen below in Figure DR-1.

Figure D1 Grande Ronde Watershed Basin

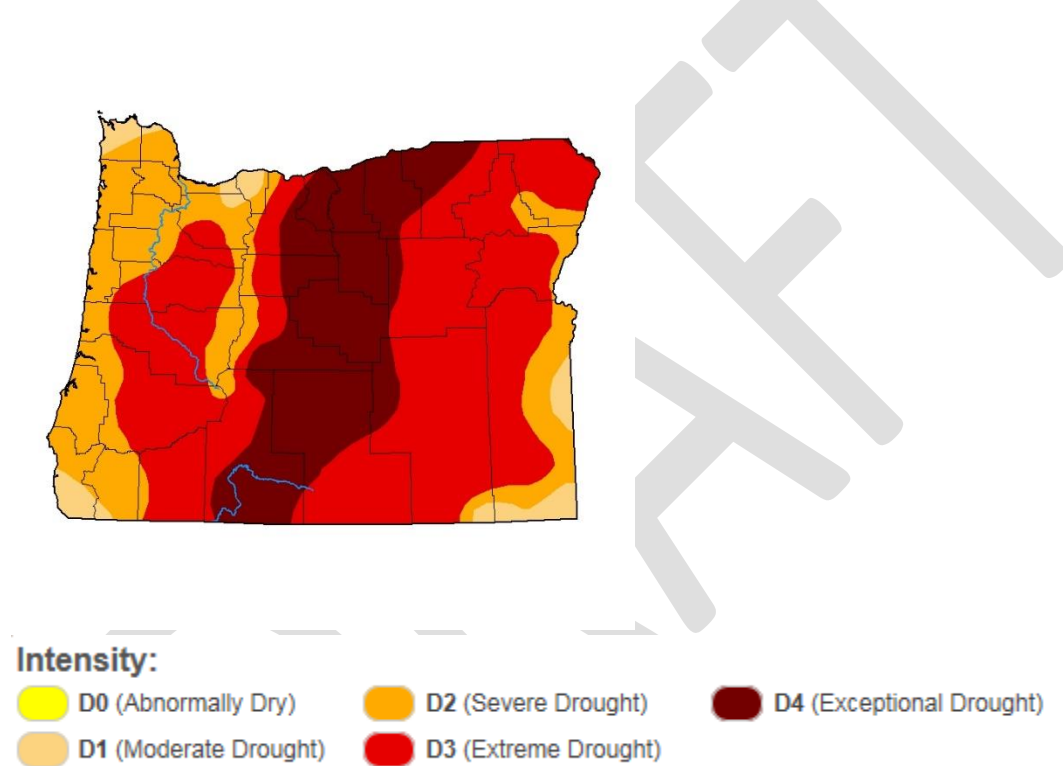


Source: Oregon Water Resource Department – Grande Ronde Basin near La Grande
http://apps.wrd.state.or.us/apps/gis/gis_map_library/

The Grande Ronde Watershed Basin, Powder Watershed Basin, and Burnt Watershed Sub-basins shown in Figure D-1 represent Baker, Union, and Wallowa Counties. Recorded data shows repeated periods of drought fluctuation including moderate drought with severe drought occurring for a substantial portion of the 2021 growing season (Figure D2).
<http://www.or.nrcs.usda.gov/snow/watersupply/swsi.html>

Figure D2: U.S. Drought Monitor – Oregon

As of August 10, 2021



History of the Hazard in Union County

Drought in Union County is a fairly common occurrence due to the semi-arid climate.

Droughts are not just a summer-time phenomenon; winter droughts can have a profound impact on the state’s agricultural sector, particularly east of the Cascade Mountains. Below-average snowfall in Oregon’s higher elevations has a far-reaching effect on the entire state, especially in terms of hydroelectric power generation, irrigation, recreation, and industrial uses. Oregon is continuously confronted with drought and water scarcity issues, despite its rainy reputation. These events generally affect areas east of the Cascades and some specific locales across the state. Severe or prolonged drought can impact Oregon’s public health, infrastructure, facilities, economy, and environment.

Drought produces conditions of climatic dryness severe enough to reduce soil moisture and water below the minimum necessary to sustain plant, animal and human life systems. The major effects from drought are: culinary water shortages, increased potential for wild land fires, damage or total loss of crops, civil unrest and economic consequences to all sectors of communities.

Specific dates of droughts that have impacted Union County include:

1904-1905 – A statewide drought period of about 18 months

1917-1931 – A very dry period throughout Oregon, punctuated by brief wet spells in 1920- 21 and 1927

1939-1941 – A three-year intense drought in Oregon

1959-1964 – Low stream flows throughout eastern Oregon

1976-1981 – Intense drought in western Oregon; 1976-77 single driest year of the century

1985-1997 – Generally a dry period, capped by statewide droughts in 1992 and 1994

1999 – Northeast Oregon, including Union County, was declared a disaster area by the Department of Agriculture due to drought. Approximately one-third of the wheat crop in those areas was lost due to weather.

2001 – Union County issued a declaration of local drought emergency.

2003 – Union County issued a declaration of local drought emergency.

2007 – Union County issued a declaration of local drought emergency.

2010-2021 – During this period, Union County met criteria for drought each year.

2015 – Union County issued a declaration of local drought emergency.

2021 – Union County issued a declaration of local drought emergency.

Risk Assessment

How are Hazard Areas Identified?

Droughts usually occur county-wide. In severe droughts, environmental and economic consequences can be significant, especially for the county's agriculture sector. The extent of the drought hazard depends on the length of time of the hazard and the local climatic conditions. In severe droughts, environmental and economic consequences can be significant.

Probability of Future Occurrence

The Union County Steering Committee rated the probability of a drought occurring for Union County as **high**, meaning one incident is likely within a 10-35 year period. The high ranking is consistent with the 2014 Union County Hazard Analysis.

Vulnerability Assessment

The effects of drought typically extend across the county and includes lake and river levels, which cause harm to wildlife, farmers, and ranchers. The effect on forests is less obvious, but can have a tremendous impact. During extended periods of drought, trees are weakened by water shortages and tree pests proliferate. Wildfires also coincide with droughts. The severity of a drought occurrence poses a risk for agricultural and timber losses, property damage, and disruption of water supplies and availability in urban and rural areas. Factors used to assess drought risk include agricultural practices, such as crop types and varieties grown, soil types, topography, and water storage capacity. The Steering Committee considered water availability as a key determinant in what is vulnerable to a drought.

There are a number of community sectors that are vulnerable to drought, and those are further explained in the Community Hazard Issues section below. The Steering Committee rated the County's vulnerability to drought as **high** meaning that 10% of the community's assets or population is likely to be affected by a drought. The high ranking is consistent with the 2014 Union County Hazard Analysis.

Risk Analysis

A risk analysis estimating the potential loss of life and property for the drought hazard in Union County has not been completed at this time.

Community Hazard Issues

What is susceptible to damage during a hazard event?

Drought is frequently an "incremental" hazard, meaning both the onset and end are often difficult to determine. Also, its effects may accumulate slowly over a considerable period of time and may linger for years after the termination of the event. Dust storms are a common occurrence during simultaneous high wind events and drought periods.

Droughts are not just a summer-time phenomenon; winter droughts can have a profound impact on agriculture, particularly east of the Cascade Mountains. Also, below average snowfall in higher elevations has a far-reaching effect, especially in terms of hydro-electric power, irrigation, recreational opportunities and a variety of industrial uses.

Drought can affect all segments of a jurisdiction's population, particularly those employed in water-dependent activities (e.g., agriculture, hydroelectric generation, recreation, etc.). Water-dependent activities, such as agriculture and ranging, are particularly vulnerable to droughts. The Steering Committee considered drought both an economic hazard (affecting employment)

and an agricultural hazard. Discussions with community members during the hazard identification process indicated that drought conditions have a negative impact on cattle ranching, specifically those not dependent on irrigation. Droughts do not impact the communities as much in terms of restricted food availability.

Domestic water-users within the cities may be subject to stringent conservation measures (e.g., rationing) and could be faced with significant increases in electricity rates.

The Region has been impacted numerous times by precipitation shortfalls/drought conditions. Seasonal irrigation water from mountain snow packs fizzles out towards the end of August. It is common to find municipal water systems imposing some type of water rationing during dry years. More specifics about the precipitation distribution can be found in the Community Profile in Appendix C. Location of reservoirs helps mitigate the impact of a drought -- water availability is not always correlated to the amount of precipitation.

Aquifer capacity is a notable concern for the watershed sub-basin in the Grande Ronde Valley. The City of La Grande is also concerned about aquifer capacities should growth continue. The amount of water within the Grande Ronde Valley is currently unknown. There is an action item to conduct an aquifer study for this sub-basin.

Facilities affected by drought conditions include communications facilities, hospitals, and correctional facilities that are subject to power failures. Storage systems for potable water, sewage treatment facilities, water storage for firefighting, and hydroelectric generating plants also are vulnerable. Low water also means reduced hydroelectric production especially as the habitat benefits of water compete with other beneficial uses.

There are also environmental consequences. A prolonged drought in forests promotes an increase of insect pests, which in turn, damage trees already weakened by a lack of water. A moisture-deficient forest constitutes a significant fire hazard (see the Wildfire summary). Discussions with community members during the hazard identification process indicate that while drought may limit the growth of fuel for wildfires, it does provide ideal conditions for wildfires to occur. Drought significantly increases the probability for lightning-caused wildfires to occur, and provides ideal conditions for the rapid spread of wildfire. In addition, drought and water scarcity add another dimension of stress to species listed pursuant to the Endangered Species Act (ESA) of 1973.

Existing Hazard Mitigation Activities

Many rural residents in Union County rely on groundwater wells for their water needs. In some years these rural wells have run dry in the late summer months due to low rainfall. The State of Oregon has a water master within the county that works with residents to coordinate water usage and conservation efforts. Real estate agents may inform new residents about the drought hazard in Union County.

The USDA Farm Service currently works with local farmers to develop continuity of operations plans in the event of drought conditions in the county.

Hazard Mitigation Action Items

Drought Action Item #1: Conduct public outreach campaigns to raise awareness about drought hazards and mitigation actions residents can take to reduce the impact of drought on the county.

Drought Action Item #2: Make information regarding droughts available to the public in either electronic formats.

Drought Action Item #3: Implement mitigations and projects identified in the Upper Grande Ronde Watershed Partnership Place-Based Integrated Water Resource Plan.

The Upper Grande Ronde Watershed Partnership Place-Based Integrated Water Resource Plan has not yet been completed. Completion of this plan is anticipated in 2021. Once complete, the link to the document will be included here.

Earthquake

Causes and Characteristics of the Hazard

Seismic events were once thought to pose little or no threat to Oregon communities. However, recent earthquakes and scientific evidence indicate that the risk to people and property is much greater than previously thought. Oregon and the Pacific Northwest in general are susceptible to earthquakes from three sources: 1) the off-shore Cascadia Subduction Zone; 2) deep intra-plate events within the subducting Juan de Fuca Plate; and 3) shallow crustal events within the North American Plate.

While all three types of quakes possess the potential to cause major damage, subduction zone earthquakes pose the greatest danger. The source for such events lies off the Oregon Coast and is known as the Cascadia Subduction Zone (CSZ). A major CSZ event could generate an earthquake with a magnitude of 9.0 or greater resulting in devastating damage and loss of life.

The specific hazards associated with an earthquake include the following:

Ground Shaking

Ground shaking is defined as the motion or seismic waves felt on the Earth's surface caused by an earthquake. Ground shaking is the primary cause of earthquake damage.

Ground Shaking Amplification

Ground shaking amplification refers to the soils and soft sedimentary rocks near the surface that can modify ground shaking from an earthquake. Such factors can increase or decrease the amplification (*i.e.*, strength) as well as the frequency of the shaking.

Surface Faulting

Surface faulting are planes or surfaces in Earth materials along which failure occurs. Such faults can be found deep within the earth or on the surface. Earthquakes occurring from deep lying faults usually create only ground shaking.

Earthquake-Induced Landslides

These landslides are secondary hazards that occur from ground shaking.

Liquefaction

Liquefaction takes place when ground shaking causes granular soils to turn from a solid into a liquid state. This in turn causes soils to lose their strength and their ability to support weight.

Tsunamis

Tsunamis are another secondary earthquake hazard created by events occurring under the ocean. A tsunami, often incorrectly referred to a "tidal wave," is a series of gravity- induced

waves that can travel great distances from the earthquake’s origin and can cause serious flooding and damage to coastal communities. As Union County is not near the Pacific Ocean’s coast, this plan will not discuss tsunamis in any more detail.

The severity of an earthquake is dependent upon a number of factors including: 1) the distance from the quake’s source (or epicenter); 2) the ability of the soil and rock to conduct the quake’s seismic energy; 3) the degree (*i.e.* angle) of slope materials; 4) the composition of slope materials; 5) the magnitude of the earthquake; and 6) the type of earthquake.

In addition to the direct effects of earthquake, there are also secondary and tertiary effects including interruption in utilities, interruption in supply chains and long-term economic impacts related to the breakdown of traditional transportation routes for Union County’s natural resource-based economy. Union County may survive the direct effects of a Cascadia Subduction Zone event relatively unscathed but may have significant secondary and tertiary effects.

History of Earthquakes in Northeast Oregon

All of Oregon west of the Cascades is at risk from the three earthquake types and associated hazards. East of the Cascades the earthquake hazard is predominately of the crustal type. The amount of earthquake damage at any place will depend on its distance from the epicenter, local soil conditions, and types of construction. Due to Oregon’s relatively short written history and the infrequent occurrence of severe earthquakes, few Oregon earthquakes have been recorded in writing. Moreover, in the past century, there have been no reported damage or injuries in the Northeast Region due to earthquakes.

In the last 42 years, the region around Northeast Oregon has been affected by several earthquakes of estimated magnitudes of three and greater. Table EQ-1 shows the location of selected Northeast Oregon region earthquakes since 1900. This data relies on the Pacific Northwest Seismic Networks database.

Table EQ 1: Significant Earthquakes in Northeast Oregon (Greater than 4.0 from 1900-Present)

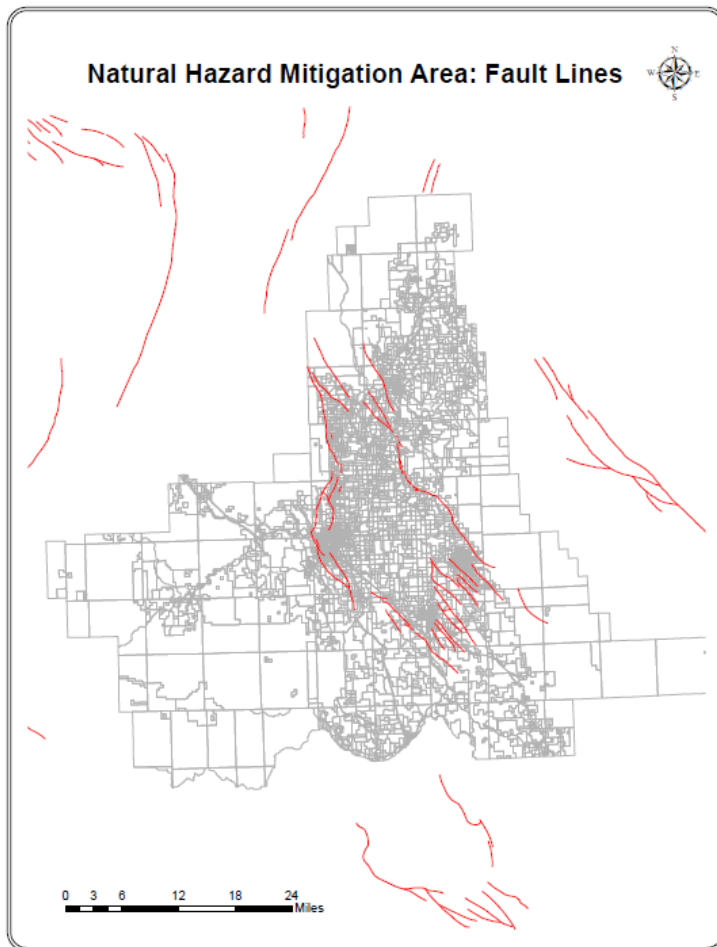
Date	Location	Magnitude
October, 1913	Hells Canyon	6.0
April, 1927	Pine Valley-Cuddy Mountain	5.0
June, 1942	Pine Valley - Cuddy Mountain	5.0
August, 1965	John Day	4.4
November, 1965	Halfway	4.3
December, 1966	Halfway	4.2

Risk Assessment

How are Hazard Areas Identified?

The earthquake hazard and its effects are prevalent over the entire county. The fault map in Figure EQ 1 below shows the prevalence of subduction zone and crustal event earthquake faults and events near Union County.

Figure EQ 1: Union County Earthquake and Fault Map

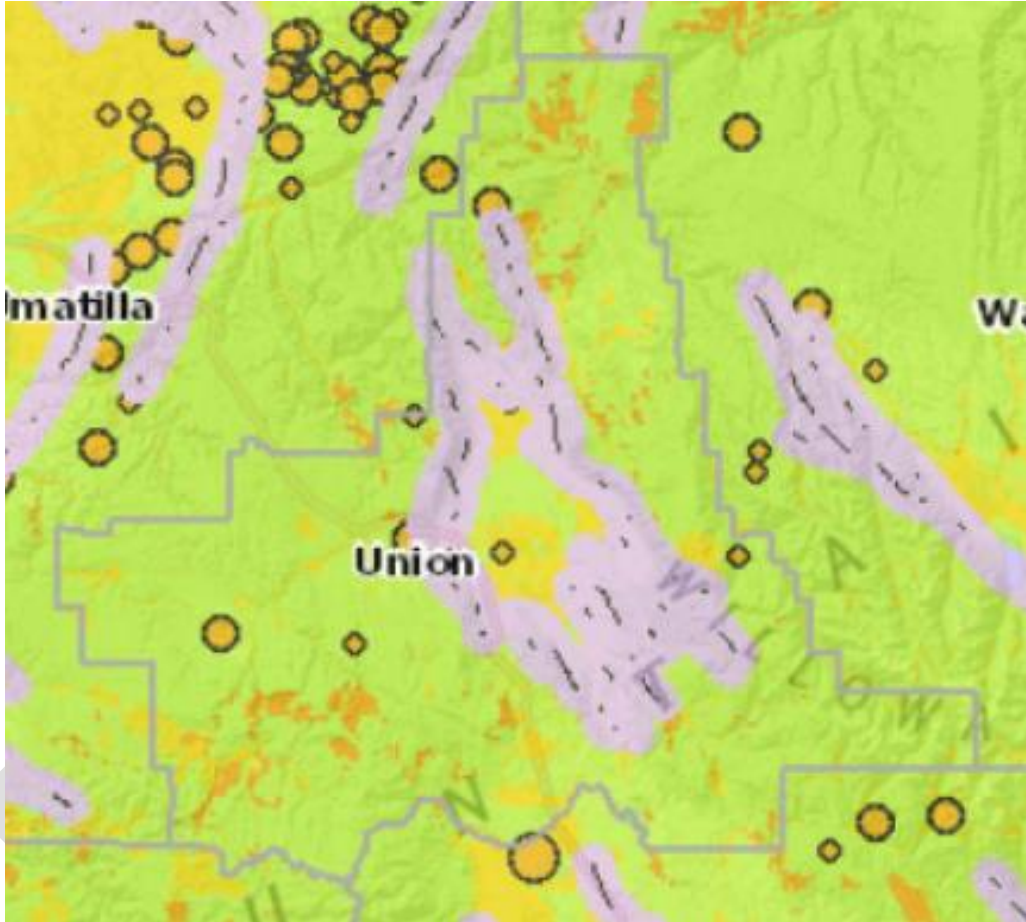


Source: Union County Planning Department

The Oregon Department of Geology and Mineral Industries (DOGAMI), in partnership with other state and federal agencies, has undertaken a rigorous program in Oregon to identify seismic hazards, including active fault identification, bedrock shaking, tsunami inundation zones, ground motion amplification, liquefaction, and earthquake induced landslides. DOGAMI has published a number of seismic hazard maps that are available for Oregon communities to use. The maps show liquefaction, ground motion amplification, landslide susceptibility, and relative earthquake hazards. OPDR used the DOGAMI Statewide Geohazards Viewer to present visual maps of expected ground shaking (Figure EQ-2) and soft

soils (Figure EQ-3). The extent of the damage to structures and injury and death to people will depend upon the type of earthquake, proximity to the epicenter and the magnitude and duration of the event. Predominant risks for the region in terms of concentration of population and assets is the City of La Grande which lies near the Grande Ronde Valley Fault Zone. The yellow color represents that the area would experience a strong expected shaking.

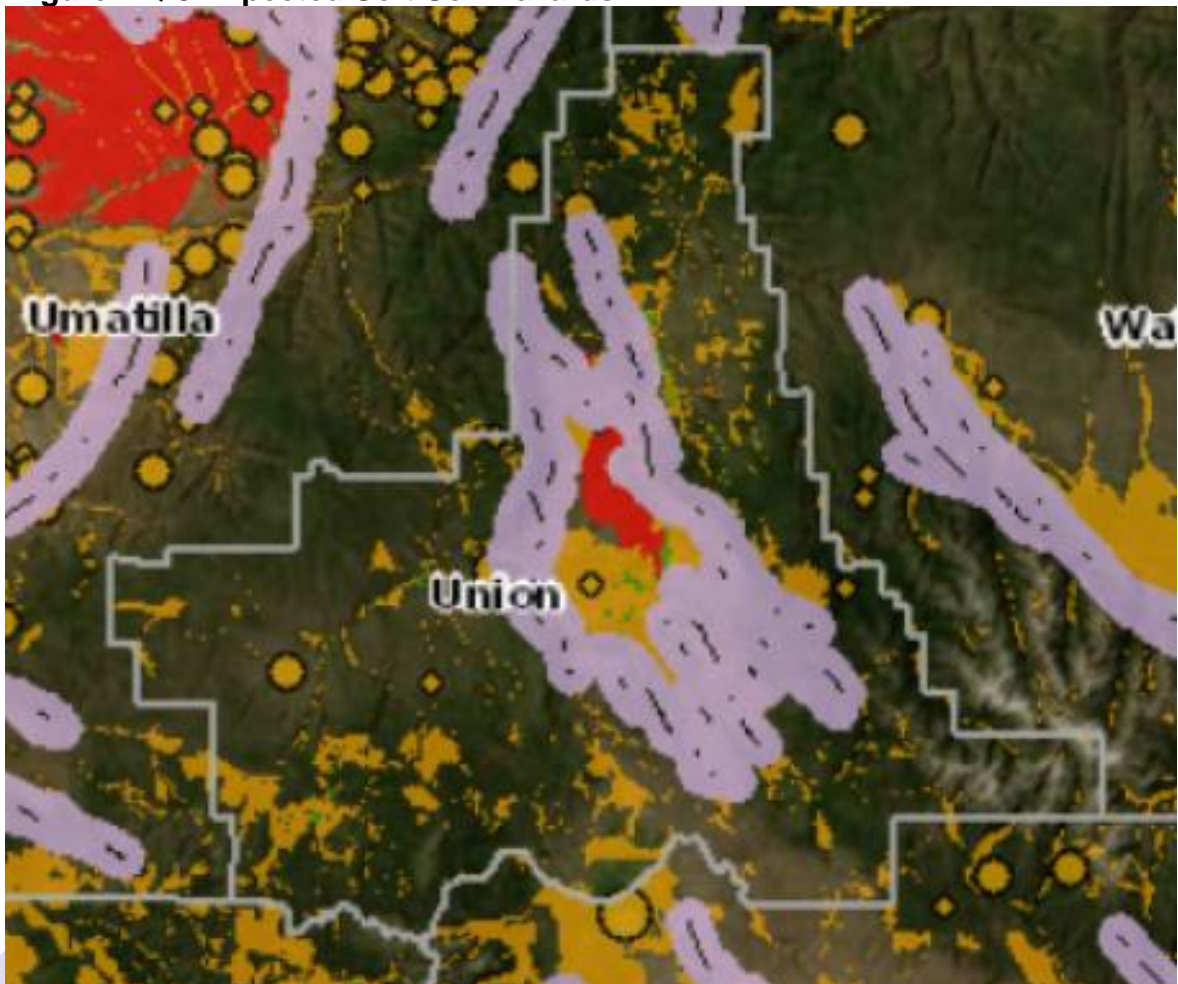
Figure EQ-2 Expected Shaking



Source: DOGAMI Hazard Viewer

Figure EQ-3 indicates the expected soft soil hazards. The red color in Union County is near La Grande and indicates a high likelihood of soil liquefaction under the appropriate earthquake.

Figure EQ-3 Expected Soft Soil Hazards



Source: DOGAMI Hazard Viewer

The extent of the earthquake hazard depends on its magnitude and proximity to Union County.

The Cascadia Subduction Zone has the potential to produce an earthquake of magnitude 9.0 or higher. A subduction zone earthquake is a significant threat to Oregon's coastal communities as they will likely be closer to the epicenter, and will therefore suffer extreme shaking and collateral damage. A Cascadia Subduction Zone earthquake will also affect Union County, although damages are not expected to be as severe as the coastal communities.

Vulnerability Assessment

The Union County Steering Committee has identified a number of community assets vulnerable to earthquakes in Union County. These vulnerable community assets are detailed in the

following two sections: “Risk Analysis” and “Community Hazard Issues.” The Steering Committee rated Union County’s vulnerability to an earthquake as **high** meaning that more than 10% of the community’s assets are likely to be affected by a major emergency or disaster. The high ranking is consistent with the 2020 Union County Hazard Analysis.

Community Earthquake Issues

Earthquake damage occurs when structures have been built that cannot withstand severe shaking. Buildings, airports, schools, and lifelines (highways, phone lines, gas, water, etc.) suffer damage in earthquakes and can ultimately result in death or injury to humans.

Death and Injury

Death and injury can occur both inside and outside of buildings due to falling equipment, furniture, debris, and structural materials. Likewise, downed power lines or broken water and gas lines endanger human life. Death and injury are highest in the afternoon when damage occurs to commercial and residential buildings and during the evening hours in residential settings.

Building and Home Damage

Wood structures tend to withstand earthquakes better than structures made of brick or unreinforced masonry buildings. Building construction and design play a vital role in the survival of a structure during earthquakes. Damage can be quite severe if structures are not designed with seismic reinforcements or if structures are located atop soils that liquefy or amplify shaking. Whole buildings can collapse or be displaced.

Bridge Damage

All bridges can sustain damage during earthquakes, leaving them unsafe for use. Some bridges have failed completely due to strong ground motion. Bridges are a vital transportation link. Because of this, damage to the bridges can make some areas inaccessible.

Bridges vary in size, materials, siting, and design, and as such, earthquakes will affect each bridge differently. Bridges built before the mid 1970's often do not have proper seismic reinforcements. These bridges have a significantly higher risk of suffering structural damage during a moderate to large earthquake. Bridges built in the 1980's and after are more likely to have the structural components necessary to withstand a large earthquake.

Damage to Lifelines

Lifelines are the connections between communities and critical services. They include water and gas lines, transportation systems, electricity, and communication networks. Ground shaking and amplification can cause pipes to break open, power lines to fall, roads and railways to crack or move, and radio or telephone communication to cease. Disruption to transportation makes it

especially difficult to bring in supplies or services. All lifelines need to be usable after an earthquake to allow for rescue, recovery, and rebuilding efforts and to relay important information to the public.

Disruption of Critical Facilities

Critical facilities include police stations, fire stations, hospitals, and shelters. These facilities provide services to the community and need to be functional after an earthquake event. The earthquake effects outlined above can all cause emergency response to be disrupted following a significant event.

Economic Loss: Equipment and Inventory Damage, Lost Income

Seismic activity can cause great loss to businesses, either a large-scale corporation or a small retail shop. Losses not only result in rebuilding cost, but fragile inventory and equipment can be destroyed. When a company is forced to stop production for just a day, business loss can be tremendous. Residents, businesses, and industry all suffer temporary loss of income when their source of finances are damaged or disrupted.

Fire

Downed power lines or broken gas mains can trigger fires. When fire stations suffer building or lifeline damage, quick response to fight the fires is less likely.

Debris

After damage occurs to a variety of structures, much time is spent cleaning up brick, glass, wood, steel or concrete building elements, office and home contents, and other materials.

The effects of earthquakes span a large area. The degree to which earthquakes are felt, however, and the damages associated with them may vary. At risk from earthquake damage are unreinforced masonry buildings, bridges built before earthquake standards were incorporated into building codes, sewer, water, and natural gas pipelines, petroleum pipelines, and other critical facilities and private property located within the county. The areas that are particularly vulnerable to potential earthquakes in the county have been identified as those with soft, alluvial sediments and lands along stream channels.

Earthquake damage to roads and bridges can be particularly serious by hampering or cutting off the movement of people and goods as well as disrupting the provision of emergency response services. Such effects can produce serious impacts on the local and regional economy by disconnecting people from work, home, school, food supplies and commercial, medical and social services. A major earthquake can separate businesses and other employers from their employees, customers, and suppliers thereby further hurting the economy. Should an earthquake damage a major transportation route, several communities in Northeast Oregon

could find themselves isolated. Lastly, following an earthquake event, the cleanup of debris could present as a huge challenge for the affected communities.

Northeast Oregon is highly vulnerable to earthquake hazards due to earthquake induced landslides and ground shaking. Transportation corridors, such as I-84, to areas with the greatest damages (west of the Cascades) would be heavily traveled with relief supplies, equipment and personnel moving in one direction and evacuees in the other.

Hazard Risk Analysis

The Steering Committee completed jurisdiction specific hazard risk analyses during this update, based upon the previous plan's analyses. The ratings are shown in tables I.1.1 and I.1.2.

Probability of Future Occurrence

Scientists estimate the chance in the next 50 years of a large subduction zone earthquake is between 10 and 20 percent, assuming that the recurrence is on the order of 400 +/- 200 years. The Union County Steering Committee rated the probability of a future seismic event for Union County as **low**, meaning that one incident is likely within a 75-100 year period. The low ranking is consistent with the 2020 Union County Hazard Analysis.

Risk Analysis

In 1999, the Department of Geology and Mineral Industries (DOGAMI) developed two earthquake loss models for Oregon based on the two most likely sources of seismic events: (1) the Cascadia Subduction Zone (CSZ), and (2) combined crustal events (500-year model). Both models are based on HAZUS, a computerized program, currently used by the Federal Emergency Management Agency (FEMA) as a means of determining potential losses from earthquakes. The CSZ event is based on a potential 8.5 earthquake generated off the Oregon Coast. The 500-Year crustal model does not look at a single earthquake (as in the CSZ model); it encompasses many faults, each with a 10% chance of producing an earthquake in the next 50 years. The model assumes that each fault will produce a single "average" earthquake during this time. Neither model takes unreinforced masonry buildings into consideration.

DOGAMI investigators caution that the models contain a high degree of uncertainty and should be used only for general planning purposes. Despite their limitations, the models do provide some approximate estimates of damage. Results are found in Table EQ 2.

Table EQ-2. Projected Dollar Losses for Union County Based on a M8.5 Cascadia Subduction Zone (CSZ) Event and a 500-Year Model Event

Total Economic Base in Thousands (1999)	Greatest Absolute Loss in Thousands (1999) from a M8.5 CSZ Event ¹	Greatest Absolute Loss in Thousands (1999) From a 500-Year Model Event
\$1,237,000	\$<1,000	\$9,000

Source: DOGAMI, 1999, Special Paper 29: Earthquake Damage in Oregon.

Community Hazard Issues

What is susceptible to damage during a hazard event?

In 2007, DOGAMI completed a rapid visual screening (RVS) of educational and emergency facilities in communities across Oregon, as directed by the Oregon Legislature in Senate Bill 2 (2005). RVS is a technique used by the Federal Emergency Management Agency (FEMA), known as FEMA 154, to identify, inventory, and rank buildings that are potentially vulnerable to seismic events. DOGAMI ranked each building surveyed with a 'low,' 'moderate,' 'high,' or 'very high' potential of collapse in the event of an earthquake. A 'very high' ranked building has a 100% risk of collapse, a 'high' ranked building has a greater than 10% chance, a 'moderate' ranked building has a greater than 1% chance of collapse and a 'low' ranked building has a 1% chance or less of collapse.

It is important to note that these rankings represent a probability of collapse based on limited observed and analytical data and are therefore *approximate* rankings. To fully assess a building's potential of collapse, a more detailed engineering study completed by a qualified professional is required, but the RVS study can help to prioritize which buildings to survey.

There are 25 identified sites in Union County. The results are summarized below, but ratings for specific buildings can be found in the RVS study on DOGAMI's website <https://www.oregongeology.org/rvs/reports.htm>. The RVS study for Union County was conducted in 2006 and the results are reflective of building conditions at that time.

The assessed buildings in Union County that have a 'very high' ranking are:

- Cove School – 3 buildings
- Elgin High School – 2 buildings

¹ "...there are numerous un-reinforced masonry structures (URMs) in Oregon, the currently available default building data does not include any URMs. Thus, the reported damage and loss estimates may seriously under- represent the actual threat" (page 126 – 1998, DOGAMI)

- Stella Mayfield Elementary School, Elgin – 2 buildings
- Imbler High School – 3 buildings
- Greenwood Elementary, La Grande – 2 buildings
- La Grande High School – 3 buildings
- Willow Elementary School – 2 buildings
- Powder Valley School, North Powder – 2 buildings
- Union High School – 1 building
- Grande Ronde Hospital – 3 buildings
- County Law Enforcement Building, La Grande – 1 building^[A1]

Those Union County buildings with a ‘high’ ranking are:

- Cove School – 1 building
- Stella Mayfield Elementary School, Elgin – 1 building
- Imbler High School – 1 building
- Island City Elementary School – 1 building
- Central Elementary School – 1 building
- La Grande High School – 1 building
- La Grande Middle School – 1 building
- Willow Elementary School, La Grande – 1 building
- Powder Valley School, North Powder – 2 buildings
- Union Elementary School – 2 buildings
- Union High School – 1 building
- Union City Police – 1 building

Of the sites evaluated by DOGAMI using RVS at the 2006 evaluation, 15 buildings have high (greater than 10% chance) collapse potential; and 23 buildings have very high (100% chance) collapse potential.

Infrastructure

Union County’s transportation infrastructure is highly vulnerable to the earthquake hazard. The primary east-west transportation route through the state of Oregon is Interstate 84, a large portion of which is located through Union County. This transportation corridor would be heavily traveled with relief supplies, equipment and personnel moving in one direction and evacuees in the other. Additionally, Highway 30, Highway 82, Highway 203, Highway 204, and Highway 237 are essential roadways connecting each of the Union County communities.

Portions of these routes lie directly on fault lines (shown in Figure EQ 1). Any damages to these routes will have impacts on Union County by limiting access to Grande Ronde Hospital, which is the only hospital located within the county. Earthquakes in Union County may also impact the Union Pacific rail line in Union County.

Aside from the transportation network, earthquakes could also impact the energy infrastructure of Union County. Specifically, the trunk lines for Oregon Trail Electric Cooperation and the natural gas line for Avista Utilities may be impacted.

As shown by the DOGAMI RVS scores, schools are particularly vulnerable to earthquakes given their older construction methods and use of unreinforced masonry materials. Another infrastructure system of Union County that could be impacted is the water and wastewater systems. Any sustained ground shaking could either damage the well fields that supply each of the communities in Union County with water or the distribution systems that transport water and wastewater.

Economic

The major economic impacts that could result from an earthquake event are disruption of transportation systems or disruption of energy systems. Union County will experience economic impacts if goods, services and people are unable to travel or if an earthquake disrupts electrical service to employers.

Much of the downtown economic area in the City of La Grande is comprised of unreinforced masonry buildings. Unreinforced masonry buildings are known to be vulnerable to seismic events.

Building Codes

The Oregon State Building Codes Division adopts statewide standards for building construction that are administered by the state, cities, and counties throughout Oregon. The codes apply to new construction and to the alteration of, or addition to, existing structures. Within these standards are six levels of design and engineering specifications that are applied to areas according to the expected degree of ground motion and site conditions that a given area could experience during an earthquake. The Structural Code requires a site-specific seismic hazard report for projects including critical facilities such as hospitals, fire and police stations, emergency response facilities, and special occupancy structures, such as large schools and prisons.

The seismic hazard report required by the Structural Code for essential facilities and special occupancy structures considers factors such as the seismic zone, soil characteristics including amplification and liquefaction potential, any known faults, and potential landslides. The findings of the seismic hazard report must be considered in the design of the building. The Dwelling Code incorporates prescriptive requirements for foundation reinforcement and framing connections based on the applicable seismic zone for the area. The cost of these requirements is rarely more than a small percentage of the overall cost for a new building.

Requirements for existing buildings vary depending on the type and size of the alteration and whether there is a change in the use of the building that is considered more hazardous. Oregon

State Building Codes recognize the difficulty of meeting new construction standards in existing buildings and allow some exception to the general seismic standards. Upgrading existing buildings to resist earthquake forces is more expensive than meeting code requirements for new construction. The state code only requires seismic upgrades when there is significant structural alteration to the building or where there is a change in use that puts building occupants and the community at greater risk.

Local building officials are responsible for enforcing these codes. Although there is no statewide building code for substandard structures, local communities have the option of adopting a local building code to mitigate hazards in existing buildings. Oregon Revised Statutes allow municipalities to create local programs to require seismic retrofitting of existing buildings within their communities. The building codes do not regulate public utilities or facilities constructed in public right-of-way, such as bridges.

Hazard Mitigation Action Items

Earthquake Action Item #1: Perform an earthquake risk evaluation in critical buildings not listed in the DOGAMI RVS report.

Earthquake Action Item #2: Seismically retrofit mission critical buildings (e.g. Grande Ronde Hospital and Union County Law Enforcement Building) to reduce seismic hazard vulnerability. Include both structural and non-structural retrofit options.

Earthquake Action Item #3: Seismically retrofit all schools to reduce the building's vulnerability to seismic hazards. Consider both structural and non-structural retrofit options.

Flood

Causes and Characteristics of Flood

Flooding results when rain and snowmelt create water flow that exceed the carrying capacity of rivers, streams, channels, ditches, and other watercourses. In Oregon, flooding is most common from October through April when storms from the Pacific Ocean bring intense rainfall. Many of Oregon's most destructive natural disasters have been floods. Flooding can be aggravated when rain is accompanied by snowmelt and frozen ground with the spring cycle of melting snow being the most common source of flood in the region.

Anticipating and planning for flood events is an important activity for Northeast Oregon. Federal programs provide insurance and funding to communities engaging in flood hazard mitigation. The Federal Emergency Management Association (FEMA) manages the National Flood Insurance Program (NFIP) and the Hazard Mitigation Grant Program (HMGP). The NFIP provides flood insurance and pays claims to policyholders who have suffered losses from floods. The HMGP provides grants to help mitigate flood hazards through activities such as elevating structures, relocating, or removing them from flood hazard areas. These programs provide grant money to owners of properties who have suffered losses from floods, and in some cases, suffered losses from other natural hazard events.

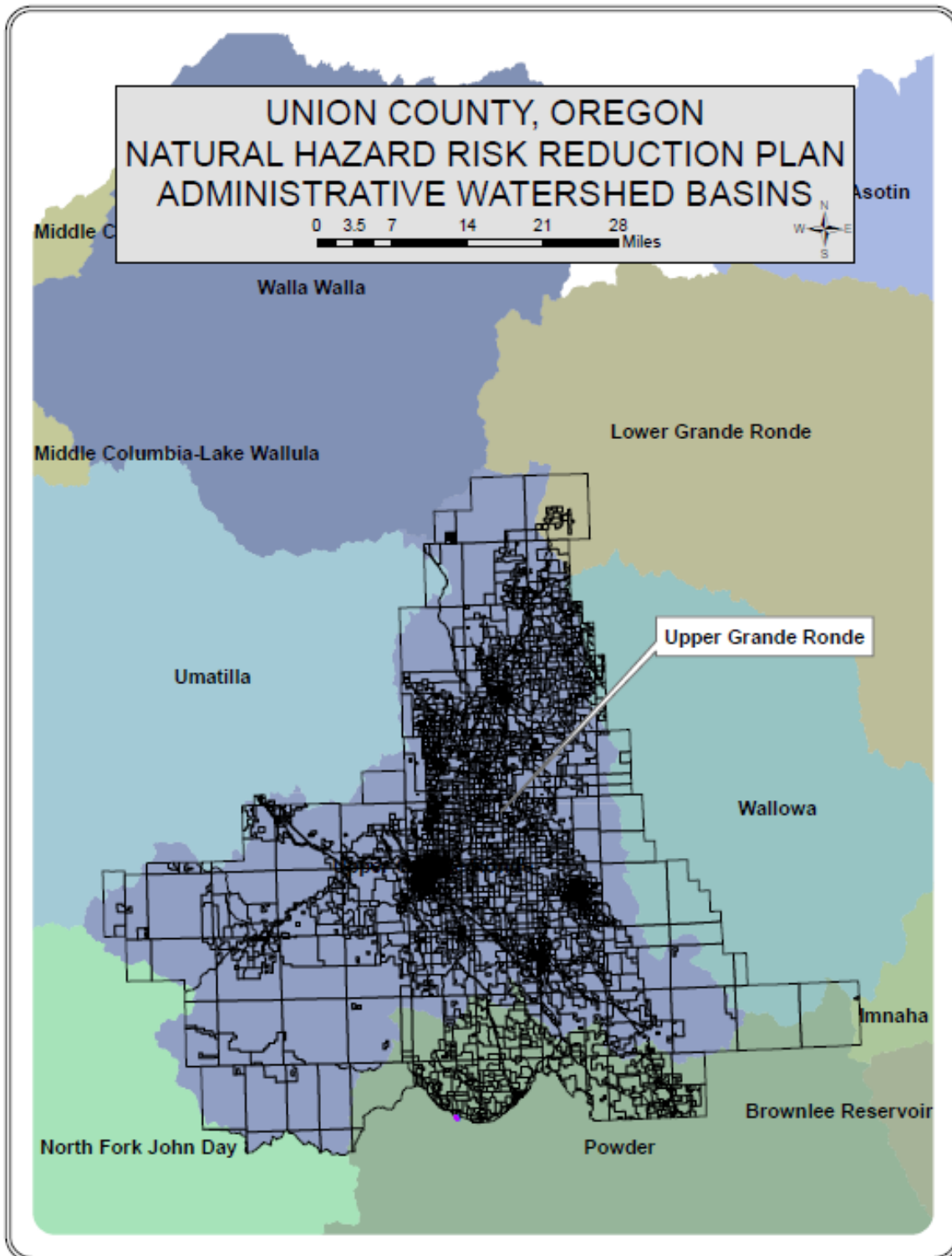
The most damaging floods have occurred during the winter months, when warm rains from tropical latitudes melt mountain snow packs. Such conditions were especially noteworthy in February 1957, February 1963, December 1964 and January 1965. Somewhat lesser flooding has been associated with ice jams, normal spring run-off, and summer thunderstorms. Heavily vegetated stream banks, low stream gradients (e.g. Grande Ronde Valley), and breached dikes have contributed to past flooding at considerable economic cost. Union County has experienced flooding associated with low bridge clearances, over-topped irrigation ditches, and natural stream constrictions.

The principal types of floods that occur in Northeast Oregon include:

Riverine Flooding

Riverine floods occur when water levels in rivers and streams overflow their banks. Most communities located along such water bodies have the potential to experience this type of flooding after spring rains, heavy thunderstorms or rapid runoff from snow melt. Riverine floods can be slow or fast rising, but usually develop over a period of days. The danger of riverine flooding occurs mainly during the winter months, with the onset of persistent, heavy rainfall, and during the spring, with melting of snow. Figure FL-1 on the next page shows the river sub-basins in Union County, Oregon, which are the sources of riverine flooding.

Figure FL-1 Map of Union County, Oregon River Sub-basins



Source: Union County Planning Department

Local Flash Floods

Summer thunderstorms are common in Eastern Oregon. During these events, normally dry gulches can quickly become raging torrents -- a flash flood. Flash floods are most common to Eastern Oregon and pose a real threat to the Union County. This is due to high summer temperatures east of the Cascades and thunderstorms that are common during the summer months. Although flash flooding occurs throughout Oregon, local geology in the region can increase the impact of this hazard. Bedrock, composed mostly of igneous rocks, is exposed at the surface throughout much of the region. Consequently, runoff is increased significantly. Flash floods typically occur in isolated areas, such as in canyons and other natural drainages. Flash flood events can also be caused by rapid spring snowmelt.

Shallow Area Floods

These floods are a special type of riverine flooding. FEMA defines a shallow area flood hazard as an area that is inundated by a 100-year flood with a flood depth between one to three feet. Such areas are generally flooded by low velocity sheet flows of water.

Snowmelt Flooding

Flooding throughout the region is most commonly linked to the spring cycle of melting snow. The weather pattern that produces these floods occurs during the winter months and has come to be associated with La Nina events, a three to seven year cycle of cool, wet weather. Brief, cool, moist weather conditions are followed by a system of warm, moist air from tropical latitudes. The intense warm air associated with this system quickly melts foothill and mountain snow. Above-freezing temperatures may occur well above pass levels (4,000-5,000 feet).

Terms Related To Flooding

Floodplain

A floodplain is land adjacent to a river, stream, lake, estuary or other water body that is subject to flooding. These areas, if left undisturbed, act to store excess floodwater. The floodplain is made up of two areas: the flood fringe and the floodway:

Floodway

The floodway is the portion of the floodplain that is closer to the river or stream. For National Flood Insurance Program (NFIP) and regulatory purposes, floodways are defined as the channel of a river or stream, and the over-bank areas adjacent to the channel. Unlike floodplains, floodways do not reflect a recognizable geologic feature. The floodway carries the bulk of the floodwater downstream and is usually the area where water velocities and forces are the greatest. NFIP regulations require that the floodway be kept open and free from development or other structures, so that flood flows are not obstructed or diverted onto other

properties. The NFIP floodway definition is “the channel of a river or other watercourse and adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than one foot.” Floodways are not mapped for all rivers and streams but are typically mapped in developed areas.

The Flood Fringe

The flood fringe refers to the outer portions of the floodplain, beginning at the edge of the floodway and continuing outward. This is the area where development is most likely to occur, and where precautions to protect life and property need to be taken.

Factors that Affect Flooding in Northeast Oregon

Precipitation

Northeastern Oregon’s precipitation is well distributed year-round with annually low levels of approximately 16 inches per year. Mountainous regions may exceed 100 inches of precipitation per year, primarily in the form of snow. This is in sharp contrast to the 37 to 50 inches normally seen in other parts of the Pacific Northwest. Low levels of precipitation are due in part by the rain shadow effect caused by the Cascade Mountains. Summer precipitation is very low, increasing the risk of wildfire and requiring irrigation for crops.

There are large seasonal variations in temperature ranging from high temperatures of 80 to 90 degrees from June to September to average highs of low teens in the winter months. Most winters bring frequent and severe winter storms characterized by temperature, wind velocity, ground saturation, and snow pack. Winter storms can slow or halt traffic, damage power lines, and kill livestock.

Geography

The Northeast Oregon Region encompasses approximately 12,808 square miles, of which 2,039 square miles is Union County. The Blue Mountain area of northeastern Oregon is quite distinct from the rest of the state in landform and climate. The region is bordered by the Snake River to east and the Columbia River to the north. Columbia River Basalt lava flows formed the high plateaus of the region; the two major mountain ranges are the Blue and Wallowa Ranges. Major rivers include the John Day, Grande Ronde, and the Snake.

Location of Development

When development is located in the floodplain, it may cause floodwaters to rise higher than before the development was located in the hazard areas. This is particularly true if the development is located within the floodway. When structures or fill are placed in the floodplain, water is displaced. Development raises the base-flood elevation by forcing the river to compensate for the flow space obstructed by the inserted structures. Over time, when

structures or materials are added to the floodplain and no fill is removed to compensate, serious problems can arise. The Union County Comprehensive Plans minimizes most development in the floodway and only under certain circumstances does it allow development in the floodplain.

Displacement of a few inches of water can mean the difference between no structural damage occurring in a given flood event and the inundation of many homes, businesses, and other facilities. Careful attention must be paid to development that occurs within the floodplain and floodway of a river system to ensure that structures are prepared to withstand base flood events.

Of the 2,039 square miles of Union County, 52% of the land is privately owned and 47.5% is federally owned. The federally owned land is almost exclusively dedicated to the United States Forest Service, which owns 47% of the total land. The Union County Comprehensive Plan requires more specifically addressed flood regulation zoning ordinances in La Grande, areas along Willow Creek in the city limits of Summerville, additional lands near the Grande Ronde River, and small streamside hill runoff areas around the perimeter of the valley. The Comprehensive Plan also mentions the potential for landslide in the county and that future development should be particularly cautious of the basalt formations that have thick layers of tuff interbedded within.

Surface Permeability

In urbanized areas, increased pavement leads to an increase in volume and velocity of runoff after a rainfall event, exacerbating potential flood hazards. Storm water systems collect and concentrate rainwater and then rapidly deliver it into the local waterway. Traditional storm water systems are a benefit to urban areas, by quickly removing captured rainwater. However, they can be detrimental to areas downstream because they create increased stream flows due to the rapid influx of captured storm water into the waterway. It is very important to evaluate storm water systems in conjunction with development in the floodplain to prevent unnecessary flooding to downstream properties. Frozen ground is another contributor to rapid runoff in the urban and rural environment.

Principal flood sources that affect Union County include the Grande Ronde River, North Powder River, Catherine Creek, Taylor Creek, Fresno Creek, Clark Creek, Indian Creek, and Wolf Creek. There are also many small streams and tributaries. These streams become inundated with excess flow from heavy rains and snow runoff.

History of Floods in Northeast Oregon

The years of 1894, 1910, 1917, 1932, and 1935 are recorded as having widespread flooding in NE Oregon although the type of flood was not noted. The Columbia Basin and NE Oregon had an unusually large snow melt producing widespread flooding in May, 1948.

December 1955-January 1956 saw an early season warm rain melting off snow with runoff on frozen ground in the Snake and Columbia Basins.

December, 1964: Severe flooding statewide, including Union County which was the result of warm rain, melted snow, and runoff on frozen ground. This was widespread and very destructive.

January, 1974: Much of the state, including Union County, had warm rain, melted snow, and runoff on frozen ground.

February, 1986: Warm rain, melted snow, runoff on frozen ground throughout the state of Oregon.

May, 1991: Union County experienced warm rain, melted snow causing considerable damage to croplands and highways. A considerable number of bridges were destroyed.

May, 1998: Eastern Oregon had persistent rains creating widespread damages.

June, 2010: Flooding occurred in Union County due to heavy rains overflowing river and creeks, including Little Creek, Wallowa River, and the Grande Ronde River in Union County. Flood damage experienced in the City of Union from Little Creek.

March, 2014: High water in the Grande Ronde River caused the River to overflow the banks in Union County.

May, 2016: High water throughout Union County.

February, 2020: Flooding occurred in Union County due to a warm rain melting off a large snow melt in a short period of time.

Risk Assessment

How are Hazard Areas Identified?

Northeast Oregon's flood hazards are identified through FEMA issued Flood Insurance Rate Maps (FIRM), in conjunction with Flood Insurance Studies (FIS). Flood records are often not well documented, particularly in unincorporated areas because the floodplains are sparsely developed. Flooding is usually caused by heavy rainfall and snowmelt when soil is near saturation. The Northeast Oregon Flood Insurance Rate Maps (FIRMs), like much of eastern Oregon are not modernized.

Repetitive Flood Loss in Northeast Oregon

Repetitive flood loss properties (those which have experienced multiple flood insurance claims) have been identified as high priority hazard projects by the NFIP. Nationwide, 40% of all flood

insurance claims are paid on just two-percent of insured properties. In Oregon, repetitive loss properties represent about one-percent of all insured properties, and account for about 14% of all claims paid (19% of the dollar amounts paid).

Flood Insurance Details

The table below shows that as of February, 2021, Union County, which includes the cities of Elgin, Island City, La Grande, Summerville, and Union, had 99 National Flood Insurance Program (NFIP) policies in place with a total value of nearly \$20.5 million. The City of Cove is not participating in the NFIP. This is a sharp decline from the June, 2013 report which showed a total of 193 policies. NFIP has paid a total of \$119,961 in claims for Union County, which consists of a total of 15 paid claims. The table displays the total number of policies in the county and how many within each town in Union County. As of February, 2021, Union County has zero repetitive flood loss properties.

Union County’s Flood Insurance Rate Maps have not been updated since 1980.

Table FL-1: Union County NFIP Policy/Claim Summary

Jurisdiction	# of Policies	Amount of Coverage	Claims	Claim amount paid
Union County	31	\$6,569,500	7	\$62,567
Cove – Not participating in NFIP	0	0	0	0
Elgin	3	\$811,000	2	\$32,901
Island City	1	\$250,000	0	0
La Grande	41	\$8,851,900	6	\$51,003
North Powder	0	0	0	0
Summerville	2	\$460,000	0	0
Union	21	\$3,512,100	4	\$18,919
Union County Totals	105	\$20,454,500	19	\$165,390

Source: State NFIP Coordinator 2021

Probability of Future Occurrence

The County Steering Committee rated the probability of a future flood event for Union County as **high**, meaning that one incident is likely within a 10-35 year period. Union County's **high** ranking is consistent with the 2020 Union County Hazard Analysis.

Vulnerability Assessment

The County Steering Committee rated the vulnerability of a future flood event for Union County as **moderate**, meaning that in a flooding event more than 1-10% of the population would be impacted. This is a change from the high ranking in the 2014 Union County Hazard Analysis.

Risk Analysis

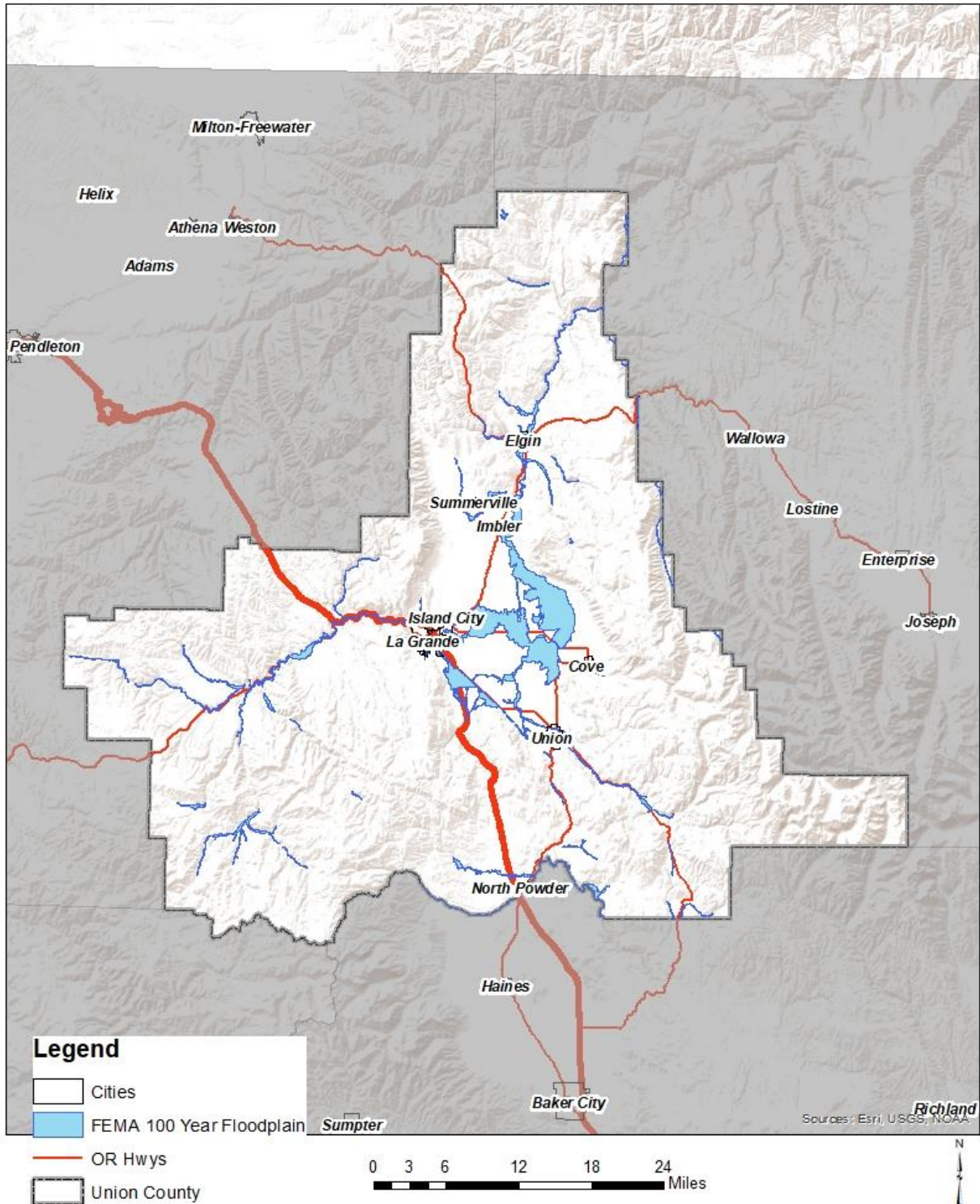
A risk analysis estimating the potential loss of life and property for the flood hazard in Union County has not been completed at this time.

Community Hazard Issues

The watersheds associated with FEMA's 100 year floodplain that pose risks to some roads and residences include the Grande Ronde, Powder, and Wallowa Rivers. There are no critical facilities, to include law enforcement and fire/rescue, schools, power generation, or hospitals in the floodplain. The majority of lands affected by these watersheds are agricultural-purposed. The Grande Ronde River affects the Cities of La Grande, Imbler, Summerville, and Elgin as well as Highway 82. This watershed frequently reaches minor flood stage in extreme weather conditions but does not often affect residences or roads. The Powder River affects the Cities of North Powder and Union and portions of Highway 237 and 203. Historically there have been no major issues with this watershed. Detailed floodplain maps are available from the Union County Planning Department, with an overview in figure FL-2.

Figure FL-2: Map of Union County 100 year floodplain (FEMA).

Union County FEMA 100 Year Floodplain



Existing Hazard Mitigation Activities

Union County participates in the (NFIP).

Hazard Mitigation Action Items

Flood Action Item #1: Explore flood mitigation opportunities.

Flood Action Item #2: Explore expanding participation in the NFIP's Community Rating System.

Flood Action Item #3: Increase awareness concerning the NFIP program.

Flood Action Item #4: Update the County and City FEMA Flood Insurance Rate Maps and digitize the updated maps.

Landslide

Causes and Characteristics of the Hazard

Landslides are a major geologic threat in almost every state in the United States. In Oregon, a significant number of locations are at risk from dangerous landslides and debris flows. While not all landslides result in property damage, many landslides do pose serious risk to people and property. Increasing population in Oregon and the resultant growth in home ownership has caused the siting of more development in or near landslide areas. Often these areas are highly desirable owing to their location along the coast, rivers and on hillsides.

Landslides are fairly common, naturally occurring events in various parts of Oregon. A landslide is any detached mass of soil, rock, or debris that falls, slides or flows down a slope or a stream channel. Landslides are classified according to the type and rate of movement and the type of materials that are transported.

In understanding a landslide, two forces are at work: 1) the driving forces that cause the material to move down slope, and 2) the friction forces and strength of materials that act to retard the movement and stabilize the slope. When the driving forces exceed the resisting forces, a landslide occurs.

Landslides can be grouped as on-site and off-site hazards. An on-site slide is one that occurs on or near a development site and is slow moving. Slow moving slides cause the most property damage in urban areas. On-site landslide hazards include features called slumps, earthflows, and block slides. Off-site slides are typically rapid moving and begin on steep slopes at a distance from homes and development. A 1996 off-site slide in southern Oregon began a long distance away from homes and road, traveled at high velocity, killed five people, and injured a number of others.

Landslides are classified based on causal factors and conditions and can be grouped into basic categories.

Erosion

Erosion occurs when ditches or culverts beneath hillside roads become blocked with debris. If the ditches are blocked, run-off from the slopes is inhibited during periods of precipitation. This causes the run-off water to collect in soil, and in some cases, cause a slide. Usually the slides are small (100-1,000 cubic yards) but they have the potential to be quite large.

Falls

This type of landslide involves the movement of rock and soil which detaches from a steep slope or cliff and falls through the air and/or bounces or rolls down slope. This type of slide is termed a rock fall and is very common along Oregon highways where they have been cut through bedrock in steep canyons.

Slides

This kind of landslide exists where the slide material moves in contact with the underlying surface. Here the slide moves along a plane and either slumps by moving along a curved surface (called a rotational slide) or along a flat surface (called a translational slide). While slow-moving slides that occur on relatively gentle slopes are less likely to cause serious injuries or fatalities, they can result in very significant property damage.

Flows

This kind of landslide is characterized as plastic or liquid in nature in which the slide material breaks up and flows during movement. This type of landslide occurs when land moves down slope as a semi-fluid mass scouring or partially scouring rock and soils from the slope along its path. A flow landslide is typically rapid moving and tends to increase in volume as it moves down slope and scours out its channel.

Rapidly moving flow landslides are often referred to as debris flows. Other terms given to debris flows are mudslides, mudflows, or debris avalanches. Debris flows frequently take place during or following an intense rainfall on previously saturated soil. Debris flows usually start on steep hillsides as slumps or slides that liquefy, accelerate to speeds as high as 35 miles per hour or more, and travel down slopes and channels onto gentle sloping or flat ground. Most slopes steeper than 70 percent are risk from debris flows.

The consistency of a debris flow ranges from watery mud to thick, rocky, mud-like wet cement which is dense enough to carry boulders, trees and cars. Separate debris flows from different starting points sometimes combine in canyons and channels where their destructive energy is greatly increased. Debris flows are difficult for people to outrun or escape from and present the greatest risk to human life. Debris flows have caused most of their damage in rural areas and were responsible for most of landslide-related deaths and injuries during the 1996 storm in Oregon.

Conditions Affecting Landslides

Natural conditions and human activities can both play a role in causing landslides. Certain geologic formations are more susceptible to landslides than others. Locations with steep slopes are at the greatest risk of slides. However, the incidence of landslides and their impact on people and property can be accelerated by development. Developers who are uninformed about geologic conditions and processes may create conditions that can increase the risk of or even trigger landslides.

There are four principal factors that affect or increase the likelihood of landslides:

- Natural conditions and processes including the geology of the site, rainfall, wave and water action, seismic tremors and earthquakes and volcanic activity.

- Excavation and grading on sloping ground for homes, roads and other structures.
- Drainage and groundwater alterations that are natural or human-caused can trigger landslides. Human activities that may cause slides include broken or leaking water or sewer lines, water retention facilities, irrigation and stream alterations, ineffective storm water management and excess runoff due to increased impervious surfaces.
- Change or removal of vegetation on very steep slopes due to timber harvesting, land clearing and wildfire.

History of Landslides in Oregon

Union County has not experienced many landslide events that impact the population or economy of the jurisdiction. Statewide, particularly noteworthy landslides accompanied storms in 1964, 1982, 1966, 1996, and 2005. Most of the landslide damage seen in Oregon has been associated with severe winter storms where landslide losses can exceed \$100 million in direct damage such as the February, 1996 event. Additional winter storm induced landslides occurred in Oregon in November, 1996. Intense rainfall on recently logged land as well as previously unlogged areas triggered over 9,500 landslides and debris flows that resulted directly or indirectly in eight fatalities. Highways were closed and a number of homes were lost. The fatalities and losses resulting from the 1996 landslide events brought about the passage of Oregon Senate Bill 12, which set site development standards, authorized the mapping of areas subject to rapidly moving landslides and the development of model landslide (steep slope) ordinances.

Annual average maintenance and repair costs for landslides in Oregon are estimated at over \$10 million. Heavier than normal rains caused thousands of landslides throughout Oregon of which roughly 9,500 were identified and added to a database. Some of these slides were the reactivation of ancient and historically active landslides and some were new failures.

Risk Assessment

How are Hazard Areas Identified?

Geologic and geographic factors are important in identifying landslide-prone areas. Stream channels, for example, have major influences on landslides, due to undercutting of slopes by stream erosion and long-term hillside processes.

The Oregon Department of Forestry (ODF) Storm Impacts Study conducted after the 1996-97 landslide events found that the highest probability for the initiation of shallow, rapidly moving landslides was on slopes of 70 to 80 percent. A moderate hazard of shallow rapid landslide initiation can exist on slopes between 50 and 70 percent.

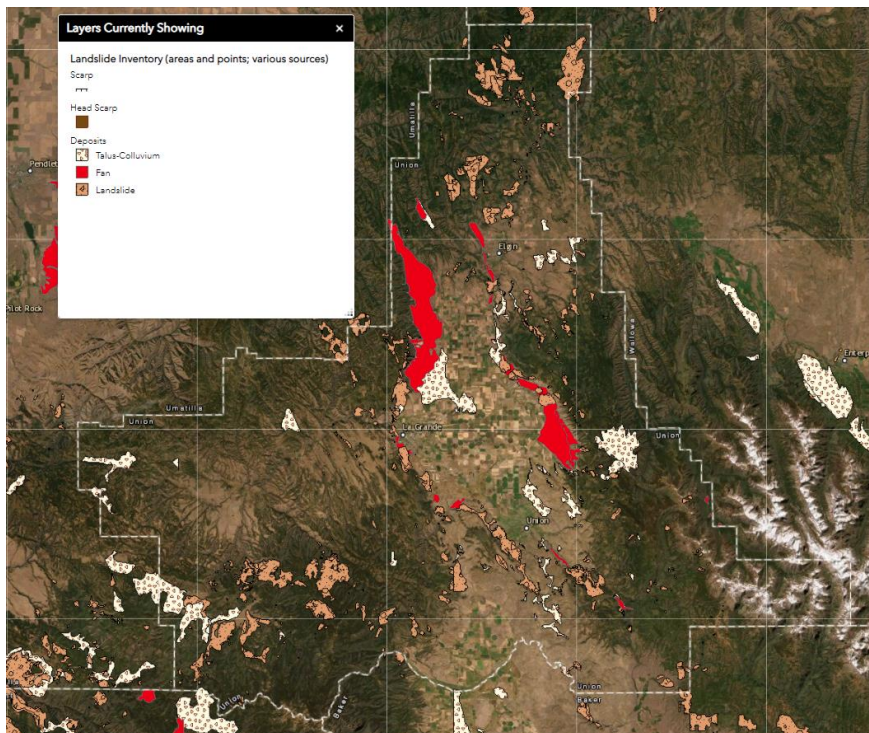
In general, areas at risk to landslides have steep slopes (25 percent or greater,) and/or a history of nearby landslides. In otherwise gently sloped areas, landslides can occur along steep river

and creek banks. At natural slopes under 30 percent, most landslide hazards are related to excavation and drainage practices, or the reactivation of preexisting landslide hazards.

The Department of Land Conservation and Development (DLCD) requires local government to address geologically unstable areas as part of their comprehensive plans throughout Statewide Land Use Planning Goal 7 (Areas Subject to Natural Hazards). Goal 7 envisions a process whereby new hazard inventory information generated by federal and state agencies is first reviewed by DLCD. DLCD then notifies the County of the new information, and the County has three years to respond to the information by evaluating the risk, obtaining citizen input, and adopting or amending implementation measures to address the risk.

The Department of Geology and Mineral Industries (DOGAMI) maps the State Landslide Information Layer for Oregon (SLIDO); Figure LS-1 documented landslide hazards in Union County, and Figure LS-2 relies on the 2012 SLIDO data and shows NE Oregon landslides that have been identified on published maps. The data shows that there is a history of landslides in the region with some major events occurring on Interstate 84. The database contains only landslides that have been located on these maps. Many landslides have not yet been located or are not on these maps and therefore are not in this database. This database does not contain information about relative hazards.

Figure LS 1: Union County Landslides (as accessed February, 2021)



Source: DOGAMI, *Statewide Landslide Information Database Oregon*

Figure LS 2: Union County Landslides



Source: DOGAMI SLIDO Viewer

The severity or extent of landslides is typically a function of geology and the landslide triggering mechanism. Rainfall initiated landslides tend to be smaller, and earthquake induced landslides may be very large. Even small slides can cause property damage, result in injuries, or take lives.

Probability of Future Occurrence

The probability of rapidly moving landslides occurring depends on a number of factors. This includes steepness of slope, slope materials, local geology, vegetative cover, human activity, and water. There is a strong correlation between intense winter rainstorms and the occurrence of rapidly moving landslides (debris flows).

The County Steering Committee rated Union County's probability of future occurrence to be **low**. This means that one event is likely every 75-100 years.

Vulnerability Assessment

To a large degree, landslides are very difficult to predict. Vulnerability assessments assist in predicting how different types of property and population groups will be affected by a hazard. The optimum method for doing this analysis at the county level is to use parcel-specific assessment data on land use and structures. Data that includes specific landslide-prone and

debris flow locations in the county can be used to assess the population and total value of property at risk from future landslide occurrences.

Landslides can impact major transportation arteries, blocking residents from essential services and businesses. Many aspects of the county are vulnerable to landslides. This includes land use and development patterns, the economy, population segments, ecosystem services, and cultural assets. The impacts to these community sectors are described in more detail in the hazard impacts section below.

The County Steering Committee rated the county's vulnerability to landslides as **low**, meaning that less than 1% of the population or regional assets will be affected by a landslide event under an average occurrence of the hazard.

Figure LS-3 Landslide Susceptibility



Risk Analysis

A risk analysis estimating the potential loss of life and property for the landslide hazard in Union County has not been completed at this time.

Community Hazard Issues

Depending upon the type, location, severity and area affected, severe property damage, injuries and loss of life can be caused by landslide hazards. Landslides can damage or temporarily disrupt utility services, roads and other transportation systems and critical lifeline services such as police, fire, medical, utility and communication systems, and emergency response. In addition to the immediate damage and loss of services, serious disruption of roads, infrastructure and critical facilities and services may also have longer term impacts on the economy of the community and surrounding area.

The areas across Union County at risk to landslides are highlighted in Figure LS-3, Land Slide Susceptibility above. Of particular concern are the areas shown in red on the map to include an area northwest of La Grande. This could impact travel on Interstate 84. A long duration closure of the Interstate may result in far-reaching economic impacts due to the high number of travelers, and the delivery of goods and services.

Increasing the risk to people and property from the effects of landslides are the following five factors:

- 1) Improper excavation practices, sometimes aggravated by drainage issues, can reduce the stability of otherwise stable slopes.
- 2) Allowing development on or adjacent to existing landslides or known landslide-prone areas raises the risk of future slides regardless of excavation and drainage practices. Homeowners and developers should understand that in many potential landslide settings there are no development practices that can completely assure slope stability from future slide events.
- 3) Building on fairly gentle slopes can still be subject to landslides that begin a long distance away from the development. Sites at greatest risk are those situated against the base of very steep slopes, in confined stream channels (small canyons), and on fans (rises) at the mouth of these confined channels. Home siting practices do not cause these landslides, but rather put residents and property at risk of landslide impacts. In these cases, the simplest way to avoid such potential effects is to locate development out of the impact area, or construct debris flow diversions for the structures that are at risk.
- 4) Certain forest practices can contribute to increased risk of landslides. Forest practices may alter the physical landscape and its vegetation, which can affect the stability of steep slopes. Physical alterations can include slope steepening, slope-water effects, and changes in soil strength. Of all forest management activities, roads have the greatest effects on slope stability, although changing road construction and maintenance practices are reducing the effects of forest roads on landslides.
- 5) High rainfall accumulation in a short period of time increases the probability of landslide. An extreme winter storm can produce inches of rainfall in a 24-hour period; if the storm occurs well into the winter season, when the ground is already saturated, the hydraulic overload effect is heightened.

Existing Hazard Mitigation Activities

The following activities are currently being carried out by local, regional, state, or national organizations.

Oregon Department of Forestry (ODF)

The Oregon Department of Forestry has provided a preliminary indication of debris flows in Western Oregon. Their debris flow maps include locations subject to naturally occurring debris flows and include the initiation sites and locations along the paths of potential debris flows (confined stream channels and locations below steep slopes). These maps neither consider the effects of management-related slope alterations such as drainage and excavation that can increase the hazard, nor do they consider very large landslides that could possibly be triggered by volcanic or earthquake activity. Areas identified in these maps are not to be considered further review areas as defined by Senate Bill 12 (1999). Information used to develop the ODF Debris Flow maps include:

- Digital elevation models at 30-meter resolution, based on U.S. Geological Survey data, were used to derive slope steepness and then to develop polygons for assigned hazards. Note that actual slopes are steeper than these digitally elevated models.
- Mapped locations of Tye soil formation and similar sedimentary geologic units.
- Oregon Department of Forestry Storm Impacts and Landslides of 1996 study; debris flow initiation and path location data.
- Stream channel confinement near steep hill slopes based on U.S. Geological Survey Digital Raster Graphics.
- Historical information on debris flow occurrence in western Oregon (from Oregon Dept. of Forestry, U.S. Forest Service, DOGAMI, Bureau of Land Management, and the Oregon Department of Transportation).
- Fan-shaped land formations below long, steep slopes.
- Areas of highest intensity precipitation do not appear to be correlated with known areas of high and extreme debris flow hazard, so precipitation intensity was not used to develop risk (hazard) ratings.

Oregon Department of Geology and Mineral Industries (DOGAMI)

The Oregon Department of Geology and Mineral Industries (DOGAMI) conducted field investigations and consolidated data on Oregon landslides associated with three flood events in 1996 and 1997. They collected evidence of over 9,000 landslide and slope failure locations in the state. The generation of a statewide landslide inventory is intended to provide a means for developing and verifying hazard models as well as to facilitate various local efforts aimed at minimizing risk and damage in future storm events. The database includes a digital Geographic Information System file with landslide locations, a digital database with details on each landslide, and an accompanying report.

In addition to the slope failures report, DOGAMI is identifying and mapping further review areas. The further review areas identify where landslides have occurred and where landslides are likely to occur.

Debris Flow Warning System

The debris flow warning system was initiated in 1997 and involves collaboration between the Department of Forestry, DOGAMI, the Department of Transportation, local law enforcement, and National Oceanic and Atmospheric Administration (NOAA) Weather Radio and other media.

Since 2008, ODF meteorologists have not issued Debris Flow Warning for Oregon since they do not have sufficient resources. However, information is provided by the National Weather Service (NWS) and broadcast via the NOAA Weather Radio, and on the Law Enforcement Data System. The information provided does not include the Debris Flow Warning system as originally designed since the NWS does not have the geologic and geomorphology expertise. Instead they provide the following language in their flood watches that highlights the potential for landslides and debris flows:

A flood watch means there is a potential for flooding based on current forecasts. Landslides and debris flows are possible during this flood event. People, structures and roads located below steep slopes, in canyons and near the mouths of canyons may be at serious risk from rapidly moving landslides.

DOGAMI provides additional information on debris flows through the media. The Department of Transportation provides warning signs to motorists in landslide prone areas during high-risk periods.

Landslide Brochure

The Department of Geology and Mineral Industries (DOGAMI) developed a landslide public outreach brochure in cooperation with several other state agencies. Forty thousand copies were printed in November 1997 (revised 2008) and were distributed widely through building code officials, county planners, local emergency managers, natural resource agency field offices, banks, real estate companies, insurance companies, and other outlets. The landslide brochure is available online at <https://www.oregongeology.org/pubs/fs/landslide-factsheet.pdf>.

Oregon State Building Code Standards

The Oregon Building Codes Division adopts statewide standards for building construction that are administered by the state and local municipalities throughout Oregon. The One- and Two-Family Dwelling Code and the Structural Specialty Code contain provisions for lot grading and site preparation for the construction of building foundations.

Both codes contain requirements for cut, fill and sloping of the lot in relationship to the location of the foundation. There are also building setback requirements from the top and bottom of slopes. The codes specify foundation design requirements to accommodate the type of soils, the soil bearing pressure, and the compaction and lateral loads from soil and ground water on sloped lots. The building official has the authority to require a soils analysis for any project where it appears the site conditions do not meet the requirements of the code, or that special design considerations must be taken. ORS 455.447 and the Structural Code require a seismic site hazard report for projects that include essential facilities such as hospitals, fire and police stations and emergency response facilities, and special occupancy structures, such as large schools and prisons. This report includes consideration of any potentially unstable soils and landslides.

Comprehensive Plan

The Union County Comprehensive Plan has language in its Goal 7 section regarding landslides: “That landslide potential will be recognized in any development south or west of La Grande, and that development will be prohibited in areas of known active landslide activity.”

Hazard Mitigation Action Items

Landslide Action Item #1: Identify, obtain, and evaluate detailed risk assessments in landslide prone areas and develop mitigation strategies to reduce the likelihood of a potentially hazardous event.

Wildfire

Communities in Union County, including the City of La Grande, adhere to the strategies outlined in the Union County Community Wildfire Protection Plan (CWPP) for mitigating the wildfire risk to wildland-urban interface areas.

Areas in Union County at risk to wildfire are identified in Chapter IV, Wildfire Risk Assessment, and Chapter VII, Communities at Risk and WUI Zone Priority Setting, of the CWPP.

Hazard Mitigation Action Items

Union County Wildfire Hazard Mitigations items are included in the Community Wildfire Protection Plan, Chapter VIII, Mitigation Action Items and Opportunities.

See the Union County Community Wildfire Protection Plan, 2016 update.

<https://union-county.org/wp-content/uploads/2013/08/CWPP.pdf>

Severe Weather

Causes and Characteristics of Severe Weather

Severe Weather hazards are common in Union County and can include dust storms, extreme heat, windstorms, and winter storms.

Dust Storms

Dust storms can be identified as strong, violent winds that carry fine particles such as silt, sand, clay, and other materials, often for long distances. A dust storm can spread over hundreds of miles and rise over 10,000 feet. They have wind speeds of at least 25 miles per hour. Dust storms usually arrive with little warning and advance in the form of a big wall of dust and debris. The dust is blinding, making driving safely a challenge. A dust storm may last only a few minutes at any given location, but often leave serious car accidents in their wake, occasionally massive pileups. The arid region of Eastern Oregon can experience sudden dust storms on windy days. These are produced by the interaction of strong winds, fine-grained surface material, and landscapes with little vegetation.

Extreme Temperatures

Northeast Oregon often experiences extreme temperatures events. From extreme cold spells in the winter months to extreme heat waves in the summer, extreme temperatures events have the potential to inflict serious health damage. When extreme temperatures occur, the body must work harder to maintain a normal temperature. These conditions can induce health related illnesses, particularly among vulnerable populations.

Windstorm

Extreme winds occur throughout Oregon. The most persistent high winds take place along the Oregon Coast and in the Columbia River Gorge. However, extreme weather events occur in all regions of Oregon. West winds generated from the Pacific Ocean are strongest along the coast and slow down inland due to the obstruction of the Coastal mountain range. Prevailing winds in Oregon vary with the seasons. The most common wind directions in summer months are from the west or northwest; in winter, they are from the south and east. Local topography, however, plays a major role in affecting wind direction. For example, the north-south orientation of the Willamette Valley channels the wind most of the time, causing predominately north and south winds.

Although rare, tornados can and do occur in Oregon. Tornadoes are the most concentrated and violent storms produced by the earth's atmosphere. They are created by a vortex of rotating winds and strong vertical motion, which possess remarkable strength and cause widespread damage. Wind speeds in excess of 300 mph have been observed within tornadoes, and it is

suspected that some tornado winds exceed 400 mph. The low pressure at the center of a tornado can destroy buildings and other structures it passes over. Tornadoes are most common in the Midwest, and are more infrequent and generally small west of the Rockies. Nonetheless, Oregon and other western states have experienced tornadoes on occasion, many of which have produced significant damage and occasionally injury or death. Oregon's tornadoes can be formed in association with large Pacific storms arriving from the west. Most of them, however, are caused by intense local thunderstorms. These storms also produce lightning, hail, and heavy rain, and are more common during the warm season from April to October. Northeast Oregon's relatively low population may cause many tornadoes to go unreported.

Winter Storm

Severe winter storms can consist of rain, freezing rain, ice, snow, cold temperatures, and wind. Winter storms occur over eastern Oregon regularly during December through February and the area is known for cold, snowy winters. In general, the region is prepared for the cold and snow, and those visiting the region during the winter, usually come prepared. However, there are occasions when preparation cannot meet the challenge. Drifting, blowing snow has often brought highway traffic to a standstill causing road closures. Windy, icy conditions have often closed mountain passes and canyons. In these situations, travelers must seek accommodations, sometimes in communities where lodging is very limited. Local residents also experience issues during winter storms. Power outages, heating, food, and the care of livestock and farm animals are regular concerns.

The National Climatic Data Center has established climate divisions in the United States for areas that have similar temperature and precipitation characteristics. Oregon's latitude, topography, and proximity to the Pacific Ocean give the state diversified climates. Union County is located in Climate Division 8 as seen in Figure SW-1. The climate in Division 8 generally consists of snowy winters and dry, hot summers.

Figure SW-1 Oregon's Climate Divisions



Source: Oregon Climate Service

Regardless of the Climate Divisions, ice storms can occur anywhere in Oregon. Like snow, ice storms are comprised of cold temperatures and moisture, but subtle changes can result in varying types of ice formation, including freezing rain, sleet, and hail. Freezing rain can be the most damaging of ice formations. While sleet and hail can create hazards for motorists when it accumulates, freezing rain can cause the most dangerous conditions within a community. Ice buildup can bring down trees, communication towers, power lines and wires creating hazards for property owners, motorists, and pedestrians. Snow storms are common to eastern Oregon. While snowfall varies by elevation, the average annual snowfall in Union County is 32 inches.

History of Severe Weather in Northeast Oregon

Severe weather incidents have historically been a threat to Northeast Oregon. The following lists the most significant severe weather storms to impact Northeast Oregon.

- December, 1861 – The Pacific Northwest had a very snowy winter. Temperatures ranged from 0 to -30 degrees. Over 10,000 cattle starved in eastern Oregon.
- August, 1898 – Heat wave in eastern Oregon resulting in record-breaking heat east of the Cascades. Pendleton reached 119 degrees.
- April, 1931 – Windstorm in NE Oregon with unofficial wind speeds reported at 78 mph. Damage to fruit orchards and timber.
- February, 1933 – A statewide cold spell resulting in the coldest February to date for eastern Oregon. Seneca reached -54 degrees – an all-time record for Oregon.
- January, 1950 – Ice/snow storm – record breaking snowfalls with extreme low temperatures.
- November, 1951 – Statewide windstorm resulting in widespread damages including transmission and utility lines. Wind speeds recorded at 40-60 mph with gusts of 75-80 mph.
- December, 1951 – Statewide windstorm with wind speeds of 60 mph in the Willamette Valley and 75 mph gusts. Damages to buildings and utility lines.
- December, 1955 – Statewide windstorm with wind speeds of 55-65 mph and gusts to 69 mph. Considerable damages to buildings and utility lines.
- January, 1957 – Statewide cold spell, including a -43 degree temperature in Seneca.
- November, 1958 – Statewide windstorm with wind speeds up to 51 mph and 71 mph gusts. Major highways blocked by fallen trees.
- March, 1960 – Statewide snowstorm resulting in heavy snow throughout the state.
- October, 1962 – Most of Oregon experienced the destructive Columbus Day Storm, which produced a barometric pressure low of 960 mb. Statewide damages estimated at \$170 million.
- January, 1963 – An ice storm in Northern Oregon resulted in a number of downed power lines, many injuries, and one reported death.

- January, 1968 – A statewide snowstorm with heavy snow, resulting in \$3-4 million in property damage.
- July-August, 1971 – A heatwave in eastern Oregon with four weeks of high temperatures – Ontario had 32 consecutive days of 100 degrees or more.
- January, 1980 – Statewide snowstorm/windstorm brought a series of snow storms, extreme winds across the state. Many injuries and power outages reported.
- February, 1985 – Statewide snowstorm with heavy snow throughout the state.
- January, 1986 – A windstorm in Union County with sustained winds of 80-90 mph in La Grande. Elgin High School gymnasium received damages.
- February, 1986 – Heavy snow in Central/Eastern Oregon resulting in traffic accidents, broken power lines and 6 to 12 inches of snow in the valleys of eastern Oregon.
- December, 1988-January, 1989 – A snowstorm in Northeastern Oregon affecting Summerville in Union County the most. Three blizzards in a four-week period.
- February, 1989 – Statewide snowstorm/cold spell with heavy snow and cold temperatures statewide.
- February, 1990 – Statewide heavy snowstorm.
- January, 1991 – Eastern Oregon heavy snowstorm.
- March, 1991 – Severe windstorm in NE Oregon.
- December, 1991 – Severe windstorm in NE Oregon.
- December, 1992 – Severe windstorm in NE Oregon mountains.
- December, 1993 – Windstorm in NE Oregon with high winds ranging between 70-80 mph and gusts up to 103 mph. No significant damage was reported.
- January, 1994 – Heavy snow throughout the NE Oregon mountains.
- May, 1994 – Severe windstorm and dust storm in eastern Oregon. Winds 55-65 mph.
- December, 1995 – Statewide, strong windstorm. Major disaster declaration FEMA-1107-DR-OR.
- Winter 1998-99 – Statewide winter storm. One of the snowiest winters in Oregon history. Snowfall at Crater Lake was 586 inches.
- July, 2003 – Windstorm in Union County resulting in \$30,000 property damages.
- December, 2003-January, 2004 – Statewide winter storm. Public assistance to state and local governments for repair or replacement of disaster damaged public facilities was available to Union County.
- March, 2004 – Dust storm in the Grande Ronde Valley required closure of roads due to poor visibility and reported vehicle crashes.
- July, 2004 – Windstorm in Union County resulting in \$300,000 in property damages.
- January, 2008 – Winter/windstorm in Union County caused extensive damage to structures, businesses, public buildings, and infrastructure in Union County prompting a governor’s disaster declaration – EO-NO-08-02.
- February, 2011 – Winter/windstorm in Union County prompted a governor’s disaster declaration – EO-NO-11-01.

- May, 2011 – Union County declared emergency due to flooding, which caused extensive damage to agricultural lands, homes, and infrastructure (roads, etc.).
- July, 2015 – Union County declared an emergency due to drought, which impacted local crop production and fire danger.
- January, 2017 – Union County declared an emergency due to severe winter conditions that made many roads impassible for extended periods of time due to blowing and drifting snow. Several buildings also experienced structural failure due to snow loading.
- February, 2020 – Flooding causes severe damage to many areas in northeast Oregon, including some areas of Union County, locally causing \$293,000 in estimated damage.
- June, 2021 – Union County experiences a severe drought, prompting local and subsequent state emergency declarations (Oregon Executive Order 21-16).

How are Hazards Identified?

Union County is vulnerable to severe weather storms. The extent of the hazard is due to a multitude of variables, such as wind speed, precipitation, direction, and temperature.

Community Severe Weather Issues

What is susceptible to damage during a hazard event?

The damaging effects of windstorms may extend for distances of 100 to 300 miles from the center of storm activity. Positive wind pressure is a direct and frontal assault on a structure, pushing walls, doors, and windows inward. Debris carried by extreme winds can contribute directly to injury and loss of life and indirectly through the failure of protective structures (i.e. buildings) and infrastructure. High winds can topple trees and break limbs which in turn can result in power outages and disrupt telephone, computer, and TV and radio services.

Negative pressure also affects the sides and roof: passing currents create lift and suction forces that act to pull building components and surfaces outward. The effects of winds are magnified in the upper levels of multi-story structures. As positive and negative forces impact and remove the building protective envelope (doors, windows, and walls), internal pressures rise and result in roof or leeward building component failures and considerable structural damage. The effects of winds are magnified in the upper levels of multi-story structures. Manufactured homes, multi-story retirement homes, and buildings in need of roof repair are structures that may be most vulnerable to wind storms. Buildings adjacent to open fields or adjacent to trees are also more vulnerable to wind storms than more protected structures.

Windstorms can result in collapsed or damaged buildings, damaged or blocked roads and bridges, damaged traffic signals, streetlights, and parks, among others. Roads blocked by fallen trees during a windstorm may have severe consequences to people who need access to emergency services. Emergency response operations can be complicated when roads are

blocked or when power supplies are interrupted. Windstorms can cause flying debris which can also damage utility lines. Overhead power lines can be damaged even in relatively minor windstorm events. Industry and commerce can suffer losses from interruptions in electric service and from extended road closures. They can also sustain direct losses to buildings, personnel, and other vital equipment. There are direct consequences to the local economy resulting from windstorms related to both physical damages and interrupted services.

Severe winter weather storms which bring snow, ice and high winds can cause significant impacts on life and property. Many severe winter storm deaths occur as a result of traffic accidents on icy roads, heart attacks while shoveling snow, and hypothermia from prolonged exposure to the cold. The temporary loss of home heating can be particularly hard on the elderly, young children and other vulnerable individuals.

Property is at risk due to flooding and landslides that may result if there is a heavy snowmelt. Additionally, ice, wind and snow can affect the stability of trees, power and telephone lines and TV and radio antennas. Down trees and limbs can become major hazards for houses, cars, utilities and other property. Such damage in turn can become major obstacles to providing critical emergency response, police, fire and other disaster recovery services.

In Northeast Oregon, ice storms occur on a frequent basis and cause significant damage, especially to local utilities. The older lines have wider spans between poles, and when ice accumulates on them, they are heavily weighed down. When the ice melts, the lines snap up and wrap around other overhead lines, causing a short and significant structural damage.

Severe winter weather also can cause the temporary closure of key roads and highways, air and train operations, businesses, schools, government offices and other important community services. Below freezing temperatures can also lead to breaks in un-insulated water lines serving schools, businesses, and industry and individual homes. All of these effects if lasting more than several days can create significant economic impacts for the communities affected as well for the surrounding region, and even outside of Oregon. In the rural areas of Oregon severe winter storms can isolate small communities, farms and ranches and create serious problems for open range cattle operations such as those in southeastern Oregon.

Winter storms can have significant impacts to the local economy. Early and late season extreme cold can damage agricultural crops, while snow and ice can block access for the distribution of crops and provision of agricultural services.

Dust Storm Probability Assessment

Approximately half of the dust in today's atmosphere may result from changes to the environment caused by human activity, including agriculture, grazing, and the cutting of forests. The Steering Committee considered the changing environment when assigning a probability score for dust storms. Dust storms occur most frequently in regions of dry soil,

where particles are loosely bound to the surface. The Union County Steering Committee rated the county's probability of dust storms as low for future occurrences.

Extreme Temperatures Probability Assessment

Extreme temperature events have frequently occurred in Union County. The Steering Committee noted that there are changing variables in the environment when assigning the score for probability. Extreme temperatures received a ranking of high probability for future occurrences.

Extreme Temperatures Vulnerability Assessment

Extreme temperatures can have a negative effect on vulnerable populations, particularly the elderly.

Windstorm Probability Assessment

The hazard history section details numerous severe windstorm events for Union County. The Steering Committee determined probability of future occurrences is moderate.

Windstorm Vulnerability Assessment

Many buildings, utilities, and transportation systems within Union County are vulnerable to wind damage. This is especially true in open areas, such as natural grasslands or farmlands. It also is true in forested areas, along tree-lined roads and electrical transmission lines, and on residential parcels where trees have been planted or left for aesthetic purposes. Structures most vulnerable to high winds in Union County include insufficiently-anchored manufactured homes and older buildings with roof structures not designed for anticipated wind loads. Fallen trees and debris are common and can block roads for long periods, in addition to bringing down power and/or utility lines.

Winter Storm Probability Assessment

The hazard history section details numerous severe winter storm events for Union County, which led the Steering Committee to determine that probability of future occurrences is high.

Destructive winter storms that produce heavy snow, ice, rain and freezing rain, and high winds have a long history in Oregon. Severe storms affecting Oregon with snow and ice typically originate in the Gulf of Alaska or in the central Pacific Ocean. These storms are most common from October through March. Ice storms are comprised of cold temperatures and moisture, but subtle changes can result in varying types of ice formation, which may include freezing rain, sleet and hail.

Winter Storm Vulnerability Assessment

Severe winter storms can cause power outages and transportation and economic disruptions, and pose a high risk for injuries and loss of life. The events can also be typified by a need to shelter and care for adversely impacted individuals. Union County has suffered severe winter storms in the past that brought economic hardship and affected the life and safety of residents. Future severe winter storms may cause similar impacts region wide. The Steering Committee determined that the vulnerability from winter storms is high.

Existing Severe Weather Mitigation Activities

Dust Storm

Soil Water and Conservation Districts have been actively promoting, through education and incentives, direct seeding methods. Direct seeding (or no-till cropping systems) results in minimal soil disturbance and reduced potential for wind and water erosion. The Cooperative State Research, Education, and Extension Service (CRSEES) funded research on a no-till crop project which can be found online through this link:

<https://www.climatehubs.usda.gov/index.php/hubs/northern-plains/topic/no-till-science-practice>

The Conservation Reserve Program (CRP) retires eligible cropland from agricultural production and plants the land with permanent grass cover to reduce erosion and therefore dust storm events.

Extreme Temperatures

FEMA has recommendations for extreme temperature mitigation activities. In order to help vulnerable population types from extreme cold events, measures should be taken to ensure that they are protected. These can include: organizing outreach to vulnerable populations by establishing and promoting accessible heating centers within the communities; requiring minimum temperatures in housing codes; encouraging utility companies to offer special arrangement for paying heating bills; and creating a database to track vulnerable populations (e.g. elderly and homeless). These activities can include locating water pipes on the inside of the building insulation or keeping them out of attics, crawl spaces and vulnerable outside walls.

Windstorm

The Oregon Building Code sets standards for structures to withstand 80 mph winds with additional requirements addressing high exposure areas.

Existing strategies and programs at the state level are usually performed by the Oregon Public Utility Commission (OPUC), Building Code Division (BCD), Oregon Department of Forestry (ODF), Oregon Emergency Management (OEM), Oregon Department of Transportation (ODOT), and the Oregon Emergency Response System (OERS), who all have vital roles in providing windstorm warnings statewide.

The Public Utility Commission ensures operators manage, construct and maintain their utility lines and equipment in a safe and reliable manner. These standards are listed on the following website: <https://www.oregon.gov/puc/Pages/default.aspx>

OPUC promotes public education and requires utilities to maintain adequate tree and vegetation clearances from high voltage utility lines and equipment.

Winter Storm

Studded tires can be used in Oregon from November 1 through March 31. They are defined under Oregon law as a type of traction tire. Research shows that studded tires are more effective than all-weather tires on icy roads, but can be less effective in most other conditions.

Social media outlets, public alerts, and/or weather warnings may be used to notify the public of significant road closures and associated winter storm impacts. For instances where travelers are stranded by winter storms and hotel capacity is exceeded, the local chapter of the Red Cross may be activated to assist in providing mass sheltering capabilities. In addition to road maintenance activities described below, local emergency response organizations may be able to stage equipment such as tracked ATVs and snowmobiles for emergency responses in areas temporarily inaccessible by vehicles ill-equipped to travel through extreme winter storm conditions.

Street/ Road/ Highway Maintenance

Highway maintenance operations are guided by local level service requirements. In general, classifications of highways receive more attention. Routes on the National Highway System network, primary interstate expressways and primary roads, will be cleared more quickly and completely.

The Oregon Department of Transportation, Union County Public Works, and each city within the county is responsible for performing precautionary measures to maintain the safety and operability of roads during winter storm conditions. The road maintenance programs are designed to provide the best use of limited resources to maximize the movement of traffic within the community during winter weather. During storm events, the focus is on clearing major arterial and collector streets first, and then respond to residential connector streets, school zones, transit routes, and steep residential streets as resources become available. The cities also have mutual aid agreements with county and the maintenance section of ODOT that allow portions of routes adjoining areas already served by other agencies.

Hazard Mitigation Action Items

Severe Weather Action Item #1: Participate in the NOAA Storm Ready Program.

Severe Weather Action Item #2: Increase resiliency to reduce weather-related power outages.

Severe Weather Action Item #3: Increase response capabilities.

Volume III: Mitigation Resources

Appendix A: Action Item Forms

Multi Hazard #1 – Maintain NHMP

Proposed Action Item:		Alignment with Plan Goals:	
Maintain the Union County NHMP Steering Committee to oversee the Union County NHMP implementation.		Goals 1, 2, 3, 4	
Alignment with Existing Plans/Policies:			
Rationale for Proposed Action Item:			
<ul style="list-style-type: none"> • It is important to provide an avenue to implement Action Items identified in the hazard mitigation planning process. • The Disaster Mitigation Act of 2000 requires communities to identify how the community will continue to involve the public in the plan maintenance process [201.6(c)(4)(iii)]. The Union County NHMP Steering Committee is one way the community can stay involved with the plan. 			
Ideas for Implementation:			
<ul style="list-style-type: none"> • Use the Union County NHMP Steering Committee’s expertise in semi-annual meetings to review and update the Union County NHMP as necessary. • Union County Emergency Services will function as the coordinating organization for this plan. 			
Coordinating Organization:	Union County Emergency Services		
Internal Partners:		External Partners:	
Union County Emergency Services		Union County NHMP Steering Committee	
Potential Funding Sources:		Estimated cost:	Timeline:
N/A, course of normal duties and no costs associated		N/A	Ongoing
Form Submitted by:	Union County		
Action Item Status:	Revised and updated (2021); retained from 2014		

Drought #1 – Conduct Public Outreach

Proposed Action Item:		Alignment with Plan Goals:	
Conduct public outreach campaigns to raise awareness about drought hazards and mitigation actions residents can take to reduce the impact of drought on the county.		Goal 2, 3	
Alignment with Existing Plans/Policies:			
Rationale for Proposed Action Item:			
<ul style="list-style-type: none"> • The Union County Steering Committee ranked the probability and vulnerability of drought as moderate. • Drought is a frequent problem in Union County, and residents should be informed about the risks that drought poses to their homes, such as the increase in wildland fire risk. In addition, homeowners should be aware of controlling water use during drought conditions to conserve water. • The Disaster Mitigation Act of 2000 requires communities to identify comprehensive actions and projects that reduce the effects of a hazard on the community [201.6(c)(3)(ii)], such as actions protecting natural resources. Conducting public outreach campaigns that raise awareness about drought hazards and mitigation actions they can implement can significantly reduce the impact of drought on Union County. 			
Ideas for Implementation:			
<ul style="list-style-type: none"> • Conduct an outreach program to inform residents of the drought status in their community, the importance of conserving water in drought periods, and strategies residents can use to limit water usage. • Develop and implement an education outreach program to encourage homeowners to install water-efficient devices in their homes. • Use existing websites to post multi-lingual advertisements to inform residents about measures they can take to mitigate against drought. • Develop wasteful water ordinances to minimize water waste in drought conditions. 			
Coordinating Organization:		Union County Emergency Services	
Internal Partners:		External Partners:	
Union County Watermaster		OSU Extension Service Department, Union County Soil & Water Conservation District, City Councils/Administrators within Union County	
Potential Funding Sources:		Estimated	Timeline:
N/A, course of normal duties and no costs associated		N/A	Ongoing
Form Submitted by:	Union County		
Action Item Status:	Revised and updated (2021); retained from 2014		

Drought #2 – Information Availability (electronic/radio)

Proposed Action Item:		Alignment with Plan Goals:	
Make information regarding droughts available to the public in either electronic or radio formats.		Goal 2	
Alignment with Existing Plans/Policies:			
Rationale for Proposed Action Item:			
<ul style="list-style-type: none"> • The Union County Steering Committee ranked the probability and vulnerability of drought as moderate. • Drought situations increase the risk of fire hazards. Drought situations cause visibility hazards due to increased dust. • Drought situations cause critical water shortages for humans, animals and vegetation. • The Disaster Mitigation Act of 2000 requires communities to identify comprehensive actions and projects that reduce the effects of a hazard on the community [201.6(c)(3)(ii)]. Agriculture is an economic driver in Union County and drought can negatively impact agriculture. 			
Ideas for Implementation:			
Add items to Emergency Services website that can hold drought information including: <ul style="list-style-type: none"> • Current Drought Status • What Homeowners can Do • Water Efficient Tips 			
Coordinating Organization:		Union County Emergency Services	
Internal Partners:		External Partners:	
		Local Media	
Potential Funding Sources:		Estimated cost:	Timeline:
N/A, course of normal duties and no costs associated		N/A	Ongoing
Form Submitted by:	Union County		
Action Item Status:	Revised and updated (2021); retained from 2014		

Drought #3 – Implement Mitigations from Place-based Water Resource Plan

Proposed Action Item:		Alignment with Plan Goals:	
Implement mitigations and projects identified in the Upper Grande Ronde Watershed Partnership Place-based Integrated Water Resource Plan.		Goal 1	
Alignment with Existing Plans/Policies:			
Union County Upper Grande Ronde Watershed Partnership Place-based Integrated Water Resource Plan			
Rationale for Proposed Action Item:			
<ul style="list-style-type: none"> • The Union County Steering Committee ranked the probability and vulnerability of drought as moderate. • The Disaster Mitigation Act of 2000 requires communities to identify comprehensive actions and projects that reduce the effects of a hazard on the community such as actions protecting natural resources [201.6(c)(3)(ii)]. Encouraging the implementation of existing action items with the county Place-based Integrated Water Resource Plan will help to ensure that water resources are readily available. • Action items included within the Place-based Integrated Water Resource Plan should be referred to and coordinated as a component of this NHMP. 			
Ideas for Implementation:			
<ul style="list-style-type: none"> • Include persons who created and/or maintain the Place-based Integrated Water Resource Plan in the NHMP semi-annual meetings. • Incorporate place-based drought mitigating water actions into the prioritization process. 			
Coordinating Organization:		Union County Emergency Services	
Internal Partners:		External Partners:	
Emergency Services, Planning Department, Watermaster		Soil and Water Conservation District, Oregon Department of Fish and Wildlife, Grande Ronde Model Watershed	
Potential Funding Sources:		Estimated cost:	Timeline:
			Ongoing
Form Submitted by:	Union County		
Action Item Status:	New item - 2021		

Earthquake #1 – Perform an Earthquake Risk Evaluation

Proposed Action Item:	Alignment with Plan Goals:
Perform an earthquake risk evaluation in critical buildings not listed on the DOGAMI RVS report.	Goal 1, 2
Alignment with Existing Plans/Policies:	
Rationale for Proposed Action Item:	
<ul style="list-style-type: none"> • The Union County Steering Committee ranked vulnerability to earthquakes as high and probability of earthquakes as low. • Oregon Senate Bill 2 (2005) directed DOGAMI to develop a statewide seismic needs assessment that includes a FEMA 154 Rapid Visual Screening survey of specific critical facilities, including schools. The Steering Committee identified several potentially vulnerable buildings not listed in survey including La Grande City Hall. • Many historic documents are located at Eastern Oregon University. • Badgley Hall at Eastern Oregon University contains a number of hazardous materials. The building has been secured by deep footings, but should a high-magnitude earthquake occur, these materials may be released. • Fuel and oil pipelines, as well as electricity, natural gas, telephone, internet, and cable companies are essential resources to Union County residents. Infrastructural redundancy does not exist for any community. • Buildings, bridges, highways and utilities that are better able to withstand earthquakes not only save lives but also enable critical activities to continue with less disruption. • The Disaster Mitigation Act of 2000 requires communities to identify actions and projects that reduce the effects of hazards on the community, particularly to buildings and infrastructure [201.6(c)(3)(ii)]. Implementing structural and non-structural retrofitting programs will reduce the seismic vulnerability of public buildings, historically important structures, and critical facilities and infrastructure, and assist a community in reducing its overall earthquake risk. 	
Ideas for Implementation:	
<p>Develop dissemination methods for structural and non-structural earthquake retrofitting to homeowners that would likely include:</p> <ul style="list-style-type: none"> • Emergency Management Website • Public service announcements • Newspaper/radio advertisements • Distribute Institute for Business and Home Safety Homeowner Retrofit Guides when requested. <p>Additionally:</p> <ul style="list-style-type: none"> • Inventory existing facilities to determine future demands for maintenance, repair, rehabilitation or replacement; and to determine adequacy of existing facilities to meet future needs. • Identify historic structures that represent a significant cultural resource for the community, focusing especially on un-reinforced masonry buildings, and identify mitigation measures to protect them from natural hazards. • Provide information for obtaining both structural and non-structural retrofits to at risk buildings as required by the risk evaluations.[RS2][A3] 	
Coordinating Organization:	Union County Emergency Services

Internal Partners:		External Partners:	
Emergency Services, Eastern Oregon University, City/County Public Works Departments		USGS, DOGAMI, FEMA OEM, Homebuilders Association, County/City Planning Departments, Building Official, Oregon Seismic Rehabilitation Grant Program, Utility Companies	
Potential Funding Sources:		Estimated cost:	Timeline:
FEMA, Oregon Seismic Rehabilitation Grant Program		Unknown	Ongoing
Form Submitted by:	Union County		
Action Item Status:	Revised and updated (2021); retained from 2013		

Earthquake #2 – Seismically Retro-fit Mission Critical Buildings

Proposed Action Item:	Alignment with Plan Goals:
Seismically retrofit mission critical buildings to reduce seismic hazard vulnerability. Include both structural and non-structural retrofit options.	Goal 1
Alignment with Existing Plans/Policies:	
Rationale for Proposed Action Item:	
<ul style="list-style-type: none"> • The Union County Steering Committee ranked vulnerability to earthquakes as high and probability of earthquakes as low. • The Grande Ronde Hospital was built in 1966 and has buildings constructed of concrete moment frames. The County Law Enforcement building, which houses the County Sheriff Department, Corrections to include the county jail, the 911 Dispatch Center, the County Emergency Operations Center, and the La Grande Police Department, was built in 1977 and has buildings constructed of reinforced masonry wall buildings with flexible diaphragms. • The Grande Ronde Hospital and the County Law Enforcement building have been identified as mission critical facilities by the Union County Steering Committee. • Oregon Senate Bill 2 (2005) directed DOGAMI to develop a statewide seismic needs assessment that includes a FEMA 154 Rapid Visual Screening survey of specific critical facilities; this assessment determined that the Grande Ronde Hospital and the County Law Enforcement Building have buildings with very high collapse potential. • Retrofitting of vital infrastructure, such as schools and community buildings, provides important improvements that reduce hazard exposure and the cost and time associated with recovery (Source: American Planning Advisory Service Report Number 483/484). • Union County has high vulnerability for seismic hazards. Retrofitting these mission critical buildings will significantly reduce vulnerability of these buildings to seismic hazards and improve the safety and continued care of community members that utilize these buildings. • The Disaster Mitigation Act of 2000 requires communities to identify actions and projects that reduce the effects of hazards on the community, particularly to buildings and infrastructure [201.6 (c)(3)(ii)]. Seismically retrofitting the Grande Ronde Hospital and the County Law Enforcement Building will reduce vulnerability and ensure the viability of these critical facilities. 	
Ideas for Implementation:	
<ul style="list-style-type: none"> • Conduct a detailed structural evaluation that outlines recommendations for building deficiencies, and provides a cost estimate, incorporate DOGAMI’s seismic assessment data to assist in retrofitting these mission critical facilities. • Apply for grant funding through the Oregon Seismic Rehabilitation Grant Program. • Apply for FEMA project grant funding. • Conduct structural evaluation and make recommendations (structural and non-structural) for fix. 	
Coordinating Organizations:	Union County; Grande Ronde Hospital
Internal Partners:	External Partners:

Emergency Services	Business Oregon, Department of Geology and Mineral Industries, Federal Emergency Management Agency, Oregon Department of Education, Oregon Office of Emergency Management	
Potential Funding Sources:	Estimated cost:	Timeline:
FEMA, Oregon Seismic Rehabilitation Grant Program	Unknown	Ongoing
Form Submitted by:	Union County	
Action Item Status:	Revised and updated (2021) retained from 2013	

Earthquake #3 – Seismically Retro-fit School Buildings

Proposed Action Item:	Alignment with Plan Goals:
Seismically retrofit schools within Union County that have not yet done so to reduce the building’s vulnerability to seismic hazards. Consider both structural and non-structural retrofit options.	Goal 1
Alignment with Existing Plans/Policies:	
Rationale for Proposed Action Item:	
<ul style="list-style-type: none"> • The Union County Steering Committee ranked vulnerability to earthquakes as high and probability of earthquakes as low. • Cove School was built in 1935 and has buildings constructed of reinforced masonry bearing wall buildings with flexible diaphragms, wood frames, and concrete shear walls. • Elgin High School was built in 1957 and has buildings constructed of reinforced masonry bearing wall buildings with flexible diaphragms and wood frames. • Greenwood Elementary School was built in 1960 and has buildings constructed of wood frames and concrete shear walls. • Imbler High School was built in 1977 and has buildings constructed of wood frames and reinforced masonry bearing wall buildings with flexible diaphragms. • La Grande High School was built in 1951 and has buildings constructed of concrete shear wall and reinforced masonry wall buildings with flexible diaphragms. • Powder Valley School was built in 1937 and has buildings constructed of reinforced masonry bearing wall buildings with flexible diaphragms and wood frames. • Stella Mayfield Elementary School was built in 1947 and has buildings constructed of concrete shear walls. • Union High School was built in 1905 and has buildings constructed of concrete shear walls. • Willow Elementary School was built in 1924 and has buildings constructed of concrete shear walls. • Oregon Senate Bill 2 (2005) directed DOGAMI to develop a statewide seismic needs assessment that includes a FEMA 154 Rapid Visual Screening survey of specific critical facilities, including schools; this assessment determined that Cove School, Elgin High School, Greenwood Elementary School, Imbler High School, La Grande High School, Stella Mayfield Elementary School, Union High School, and Willow Elementary School each have one or more buildings with a very high collapse potential. • Retrofitting of vital infrastructure, such as schools and community buildings, provides important improvements that reduce hazard exposure and the cost and time associated with recovery (Source: American Planning Advisory Service Report Number 483/484) • Union County has high vulnerability for seismic hazards. Retrofitting these schools will significantly reduce the school’s vulnerability to seismic hazards and improve the safety of students, teachers, and community members that use the schools. • The Disaster Mitigation Act of 2000 requires communities to identify actions and projects that reduce the effects of hazards on the community, particularly to buildings and infrastructure [201.6 (c)(3)(ii)]. Seismically retrofitting these schools will reduce its vulnerability and ensure the viability of this critical facility. 	
Ideas for Implementation:	

<ul style="list-style-type: none"> • Conduct a detailed structural evaluation that outlines recommendations for building deficiencies, and provides a cost estimate, incorporate DOGAMI’s seismic assessment data to assist in retrofitting these schools. • Apply for grant funding through the Oregon Seismic Rehabilitation Grant Program. • Apply for FEMA project grant funding. • Conduct structural evaluation and make recommendations (structural and non-structural) for fix. • Align project with School District Maintenance Plans. 		
Coordinating Organizations:	Union County School Districts	
Internal Partners:	External Partners:	
Emergency Management	Business Oregon, Union County School Districts, Department of Geology and Mineral Industries, Federal Emergency Management Agency, Oregon Department of Education, Oregon Office of Emergency Management	
Potential Funding Sources:	Estimated cost:	Timeline:
FEMA, ODE, DOGAMI, Oregon Seismic Rehabilitation Grant Program		Ongoing
Form Submitted by:	Union County	
Action Item Status:	Revised and updated (2021) retained from 2013	

Flood #1 – Explore Flood Mitigation Opportunities

Proposed Action Item:		Alignment with Plan Goals:	
Explore flood mitigation opportunities for homes, businesses, and critical facilities subject to flooding.		Goal 1	
Alignment with Existing Plans/Policies:			
Rationale for Proposed Action Item:			
<ul style="list-style-type: none"> • The Union County Steering Committee ranked probability of floods as high and vulnerability as moderate. • The Grande Ronde River has caused flooding damage. • The City of Elgin’s lagoons are in the flood plain (below Fish Trap Road). • The City of Cove has failing culverts in public right of way, which lead to local flooding. • The City of La Grande was recently affected by a flood (2011) which did not occur in the flood plain. Debris in streams from homes and landscaping were the primary reasons for the flood. The City is prone to flash floods. • The Disaster Mitigation Act of 2000 requires communities to identify mitigation actions that address existing buildings and infrastructure [201.6(c)(3)(ii)]. Exploring flood mitigation opportunities for homes will reduce the effect of a flood hazard on the community and help to protect existing buildings from natural hazard events. Eliminating or limiting development in hazard prone areas, such as floodplains, can reduce vulnerability to hazards. 			
Ideas for Implementation:			
<ul style="list-style-type: none"> • Assess flooding hazards within each county to determine where mitigation efforts are most needed. Identify suitable mitigation projects for each scenario. • Develop acquisition and management strategies to preserve parks, trails, and open space in the floodplain. • Implement mechanical and structural fixes during planned upgrades/expansions. Possibly elevate properties. • Seek qualification for the Flood Mitigation Assistance Program (FMA). Identify the number of buildings and/or structures in the floodplain. • Explore multi-objective stream enhancement projects. 			
Coordinating Organization:		Relevant City Public Works Departments, Union County Public Works, Union County Emergency Services	
Internal Partners:		External Partners:	
Public Works, Planning Department, City of La Grande, City of Elgin, City of Cove		FEMA, Homeowners	
Potential Funding Sources:		Estimated cost:	Timeline:
			Ongoing
Form Submitted by:	Union County		
Action Item Status:	Revised and updated (2021) retained from 2013		

Flood #2 – Explore Expanding Participation in NFIP

Proposed Action Item:		Alignment with Plan Goals:	
Explore the costs and benefits of expanding the NFIP’s Community Rating System.		Goal 1, 2	
Alignment with Existing Plans/Policies:			
Rationale for Proposed Action Item:			
<ul style="list-style-type: none"> • The Union County Steering Committee ranked probability of floods as high and vulnerability as moderate. • The National Flood Insurance Program’s (NFIP) Community Rating System (CRS) is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. As a result, insurance premiums under the NFIP are discounted to reflect the reduced flood risk resulting from the community actions. • The Community Rating System rewards communities that undertake floodplain activities beyond the requirements of the National Flood Insurance Program. The CRS is a point system program that reduces flood insurance premiums for the citizens of the participating communities. • The current amount insurance in force for Union County is \$20,454,500. Participating in the CRS program could reduce this amount. The total amount of claims paid for Union County is \$165,390. • The Disaster Mitigation Act of 2000 requires communities to identify mitigation actions that address existing buildings and infrastructure [201.6(c)(3)(ii)]. Improving the CRS ratings for communities in Northeast Oregon helps decrease vulnerability to floods. 			
Ideas for Implementation:			
<ul style="list-style-type: none"> • Assess current community activities to determine whether the city or county is already eligible to apply for a CRS classification better than 10. • Determine the CRS classification your community would like to obtain, and take steps towards reaching that goal. • Work towards obtaining higher CRS class ratings (1 being the highest rating obtainable; 10 being a non-participating community). Activities that reduce flood insurance premiums fall under four categories: Public Information, Mapping and Regulations, Flood Damage Reduction, and Flood Preparedness. • Seek Silver Jackets assistance for CRS credit completion. 			
Coordinating Organization:		Interested Cities, Union County	
Internal Partners:		External Partners:	
Union County Planning Department, Public Works, and Emergency Services; City Public Works		FEMA, Silver Jackets	
Potential Funding Sources:		Estimated cost:	Timeline:
			Ongoing
Form Submitted by:	Union County		
Action Item Status:	Revised and updated (2021) retained from 2013		

Flood #3 – Increase Awareness in the NFIP Program

Proposed Action Item:		Alignment with Plan Goals:	
Increase awareness of the NFIP program		Goals 3, 4	
Alignment with Existing Plans/Policies:			
Rationale for Proposed Action Item:			
<ul style="list-style-type: none"> • The Union County Steering Committee ranked probability of floods as high and vulnerability as moderate. • The market penetration of flood insurance is low within Union County and the cities participating in this NHMP. Union County has a total of 105 flood insurance policies which includes a total of 41 for the City of La Grande. Of this total, there are 61 pre-FIRM policies (25 for City of La Grande). • The Disaster Mitigation Act of 2000 requires communities to include a process for continued public involvement in the maintenance of the plan [201.6(c)(4)(iii)]. Increasing public awareness of the National Flood Insurance Program (NFIP) will allow continued public involvement and will inform residents and businesses of the benefits of the NFIP program and how the NFIP can protect their property. 			
Ideas for Implementation:			
<ul style="list-style-type: none"> • Distribute information about the National Flood Insurance Program to current and future homeowners/renters in flood-prone areas. • Increase awareness for current homeowners and prospective buyers of property about floodplain issues on their property and actions they can implement to mitigate the impacts of a flood. 			
Coordinating Organization:		Local flood plain managers, Union County Emergency Services	
Internal Partners:		External Partners:	
City, County Planning Departments, Emergency Services		NFIP Floodplain Coordinator, Insurers, Realtors, FEMA	
Potential Funding Sources:		Estimated cost:	Timeline:
			Ongoing
Form Submitted by:	Union County		
Action Item Status:	Revised and updated (2021) retained from 2013		

Flood #4 – Update FEMA Flood Insurance Rate Maps

Proposed Action Item:		Alignment with Plan Goals:	
Continue updating the County and City FEMA Flood Insurance Rate Maps and digitize the updated maps.		Goal 1	
Alignment with Existing Plans/Policies:			
Rationale for Proposed Action Item:			
<ul style="list-style-type: none"> • The Union County Steering Committee ranked probability of floods as high and vulnerability as moderate. • Flood Mitigation Assistance funds require that the plan describe the community’s vulnerability to flood in terms of the types and numbers of existing buildings (including repetitive loss structures), infrastructure, and critical facilities located in the identified hazard areas. • Currently, communities in Northeast Oregon are only able to identify the number of NFIP claims that have been made since FIRM adoption. Flood Insurance Rate Maps in each of the Northeast Oregon communities are too old to be currently accurate, and counting the numbers of existing buildings, infrastructure, and critical facilities located in flood-prone areas was not possible during the 2013 Natural Hazard Mitigation Planning Process. • Updates to the Flood Insurance Rate Maps from FEMA are in progress for the City of La Grande and portions of Union County. Due to the age of the maps not yet updated and technology used at the time, the maps may not accurately represent present flood conditions. Dates for the most recent FIRMS for Union County are 1996. Union County has had a total of 15 paid claims totaling \$119,961 due to flood related losses. 			
Ideas for Implementation:			
<ul style="list-style-type: none"> • Hire an individual to physically count the number of buildings and/or structures in the floodplain. Assess the types and numbers of existing buildings (including repetitive loss structures), infrastructure, and critical facilities located in the identified flood hazard areas. • Update the Flood Insurance Rate Maps. Collect topological maps, road maps, base elevation data and a description of at-risk populations/structures. • Convert the updated maps to digital maps. Using GIS, overlay digital FIRM maps against current property maps. Count and document the number of structures lying within the floodplain. • Determine the locations of flood-prone areas not identified by the FIRMs. 			
Coordinating Organization:	City, County Public Works, Emergency Services, Planning Department		
Internal Partners:		External Partners:	
City and County Planning Departments, GIS representative		DOGAMI	
Potential Funding Sources:		Estimated cost:	Timeline:
		N/A	Ongoing
Form Submitted by:	Union County		
Action Item Status:	Revised and updated (2021) retained from 2013		

Landslide #1 – Detailed Risk Assessment

Proposed Action Item:		Alignment with Plan Goals:	
Identify, obtain, and evaluate detailed risk assessments in landslide prone areas and develop mitigation strategies to reduce the likelihood of a potential hazardous event.		Goals 1, 4	
Alignment with Existing Plans/Policies:			
Rationale for Proposed Action Item:			
<ul style="list-style-type: none"> • The Union County Steering Committee ranked vulnerability and probability of landslide as low. • The Steering Committee identified landslide prone areas within the county that may need a detailed risk assessment. This includes: <ul style="list-style-type: none"> ○ Hamburger Hill ○ Highway US 30 connecting to I-84 ○ Minam Grade – Highway 82 connection to Wallowa County • The Eastern Oregon University NHMP had an action item calling for a detailed landslide study to be completed near the University. • The hill behind and which Grande Ronde Hospital sits has been recently assessed for landslide hazards. • The Disaster Mitigation Act of 2000 requires that communities identify actions and projects the reduce the impact of a natural hazard on the community, particularly to new and existing buildings and infrastructure [201.6(c)(3)(ii)]. Identifying areas vulnerable to landslide can reduce the impacts of landslides on new and existing developments and infrastructure. 			
Ideas for Implementation:			
<ul style="list-style-type: none"> • Improve knowledge of debris flow (rapid moving) landslide hazard areas. • Map steep slope areas. • Research existing community ordinances related to steep slope developments. 			
Coordinating Organization:		County Public Works Departments	
Internal Partners:		External Partners:	
County Planning Department, City of La Grande		Department of Geology and Mineral Industries, United States Geological Survey, Oregon Department of Transportation, Eastern Oregon University	
Potential Funding Sources:		Estimated cost:	Timeline:
		N/A	Long term
Form Submitted by:	Union County		
Action Item Status:	Revised and updated (2021) retained from 2013		

Severe Weather #1 – Participate in the NOAA Storm Ready Program

Proposed Action Item:	Alignment with Plan Goals:
Participate in the NOAA Storm Ready Program	Goal 1
Alignment with Existing Plans/Policies:	
Rationale for Proposed Action Item:	
<ul style="list-style-type: none"> • The Union County Steering Committee ranked vulnerability and probability of severe winter weather as high; vulnerability and probability of extreme heat was ranked as moderate; vulnerability of windstorm was ranked as low and probability of windstorm as moderate; vulnerability and probability of dust storm was ranked low. • Union County experiences extreme cold, high winds, winter storms, heavy rain, thunderstorms, and occasional tornados. • Typically, winter weather will close interstate traffic, placing increased demands on lodging, rest stops, and local emergency services. • Extreme winds are not uncommon in Eastern Oregon valleys and canyons. • Only nine tornados have been recorded in Eastern Oregon since 1888, but they have caused damage to timber resources, personal property, and critical infrastructure. • Thunderstorms can bring heavy winds, rain, hail, and lightning, which can all lead to mudslides, power outages, and damages to crop-producing fields. • All structures, particularly those on the valley floor, are subject to severe weather, including ice and snow storms, lightning storms, and hail, heavy rain, and fast winds. Information pertaining to weather-related hazards and mitigation techniques would be helpful for new home-owners and developers in the area. • The Disaster Mitigation Act of 2000 requires communities to identify a comprehensive range of actions and projects that reduce the effects of hazards on the community [201.6(c)(3)(ii)], such as actions addressing emergency services. Participating in NOAA's Storm Ready Program will reduce the impact of a severe weather event on a community by helping community members strengthen safety programs. • The benefits for becoming a NOAA Storm Ready Program community include: <ul style="list-style-type: none"> ○ Enhance available coverage through NOAA weather radio ○ Identify and pursue funding sources for weather alert radio purchases ○ Provide staff support to assist with NOAA Storm Spotter program 	
Ideas for Implementation:	
<ul style="list-style-type: none"> • The steps for becoming a Storm Ready Community include: <ul style="list-style-type: none"> ○ Contact the local Pendleton National Weather Service and contact the local Warning Coordination Meteorologists (WCM) ○ Complete a Storm Ready form and send it to the local WCM ○ Arrange a verification visit ○ Receive Local Advisory Board Approval ○ More information can be found at: https://www.weather.gov/StormReady 	
Coordinating Organization:	Union County Emergency Services

Internal Partners:		External Partners:	
County Public Works Departments, County Roads Departments, Interested Cities, local fire departments		National Oceanic and Atmospheric Administration, National Weather Service - Pendleton, HAM, Oregon Department of Transportation, American Red Cross, local radio stations, Eastern Oregon University, United States Geological Survey	
Potential Funding Sources:		Estimated cost:	Timeline:
			Long Term
Form Submitted by:	Union County		
Action Item Status:	Revised and updated (2021) retained from 2013		

Severe Weather #2 – Increase Resiliency to Reduce Weather-Related Power Outages

Proposed Action Item:		Alignment with Plan Goals:	
Increase resiliency to reduce (and mitigate) weather-related power outages		Goal 1	
Alignment with Existing Plans/Policies:			
Rationale for Proposed Action Item:			
<ul style="list-style-type: none"> The Union County Steering Committee ranked vulnerability and probability of severe winter weather as high; vulnerability and probability of extreme heat was ranked as moderate; vulnerability of windstorm was ranked as low and probability of windstorm as moderate; vulnerability and probability of dust storm was ranked low. High windstorms or winter icing storms can cause damage to long spans between power poles and create power outages. If poles are inserted between spans this reduces the risk of outages. Additionally, by anchoring certain poles this can reduce the amount of line, which would go down in a storm. Both items reduce the cost of repair and replacement. Overhead electrical lines are subject to high winds and winter storm damage. During winter storms access to the line by the utility can be difficult and this delays the time for restoration of power to the services. Burying overhead power lines would remove the risk of damage from wind and winter storm events. Non-profit electric cooperatives are eligible to receive grant funding through the Hazard Mitigation Grant Program. The Disaster Mitigation Act of 2000 requires communities to develop comprehensive actions to reduce the impacts of natural hazards, with an emphasis on new and existing buildings and infrastructure [206.6(c)(3)(ii)]. Shortening the spans between long lines and anchoring poles will reduce the likelihood of lines breaking during wind and winter icing storms. Burying overhead lines in winter storm and windstorm prone areas will reduce the impact of severe weather on power lines, and will continue power service. 			
Ideas for Implementation:			
<ul style="list-style-type: none"> The utility company would be responsible to identifying high wind and icing areas from previous outages and apply for grants to bury overhead power lines. Inform Oregon Trail Electric Cooperative about this action item and provide guidance on the available funding sources. Secure portable/backup generation capacity to minimize impact on critical infrastructure and facilities. 			
Coordinating Organization:		Union County Electric Cooperatives	
Internal Partners:		External Partners:	
County Emergency Services, Public Works		Other relevant utility companies	
Potential Funding Sources:		Estimated cost:	Timeline:
		N/A	Ongoing
Form Submitted by:		Union County	
Action Item Status:		Revised and updated (2021) retained from 2013	

Severe Weather #3 – Increase Response Capabilities

Proposed Action Item:		Alignment with Plan Goals:	
Develop and increase response capabilities for severe storm events.		Goal 1, 4	
Alignment with Existing Plans/Policies:			
Rationale for Proposed Action Item:			
<ul style="list-style-type: none"> • The Union County Steering Committee ranked vulnerability and probability of severe winter weather as high; vulnerability and probability of extreme heat was ranked as moderate; vulnerability of windstorm was ranked as low and probability of windstorm as moderate; vulnerability and probability of dust storm was ranked low. • Extreme winter weather can cause many road closures resulting in stranded travelers and citizens. <ul style="list-style-type: none"> ○ Stranded travelers may require temporary sheltering. ○ Citizens unable to leave their home for necessary medical treatments, prescriptions. • Structural failures can result from heavy snow loads. • The Disaster Mitigation Act of 2000 requires communities to identify actions and projects that reduce the effects of hazards on the community, particularly to new and existing buildings and infrastructure [201.6(c)(3)(ii)]. 			
Ideas for Implementation:			
<ul style="list-style-type: none"> • Upgrade and maintain off-road and snow equipment for emergency response in rural areas. • Increase capacity of temporary traffic controls. • Provide education of effects of heavy snow loads/structural failures. • Maintain and increase capacity of Red Cross mass sheltering capabilities. • Maintain and increase capability of Search and Rescue to respond to severe weather emergencies. • Increase capacity for road clearing capabilities during winter storm surge. • Identify available grant opportunities for each of the above-listed items. 			
Coordinating Organization:		Union County Emergency Services	
Internal Partners:		External Partners:	
County Emergency Services, Public Works		American Red Cross, Search and Rescue	
Potential Funding Sources:		Estimated cost:	Timeline:
			Ongoing
Form Submitted by:	Union County		
Action Item Status:	Added 2021		

Wildfire #1 – Implement Wildfire Mitigations Identified in CWPP

Proposed Action Item:		Alignment with Plan Goals:	
Implement wildfire mitigation action items as identified in Union County’s Community Wildfire Protection Plan.		Goals 1 and 4	
Alignment with Existing Plans/Policies:			
Union County Community Wildfire Protection Plan 2016 https://union-county.org/wp-content/uploads/2013/08/CWPP.pdf			
Rationale for Proposed Action Item:			
<ul style="list-style-type: none"> • The Union County Steering Committee ranked the vulnerability and probability of wildfire as moderate. • The Disaster Mitigation Act of 2000 requires that mitigation plans provide a comprehensive range of actions and projects to mitigate against natural hazards [201.6(c)(3)(ii)], such as actions that protect natural resources. Encouraging the implementation of existing action items with the Counties’ Community Wildfire Protection Plans will help to ensure that wildfire mitigation remains a cooperative priority in Union County • The Union County CWPP developed extensive risk assessments and identified mitigation actions. The CWPP should be considered as a supplement to the Wildfire section of this NHMP as it contains accurate, updated and extensive information about the vulnerability, risk, and mitigation actions. • Action items included within the CWPP should be referred to and coordinated as a component of this NHMP. 			
Ideas for Implementation:			
<ul style="list-style-type: none"> • Include persons who created and/or maintain the CWPP at semi-annual meetings. Incorporate CWPP actions into the project prioritization process. 			
Coordinating Organization:		Union County Emergency Services	
Internal Partners:		External Partners:	
County Emergency Services and Planning Departments		Oregon Department of Forestry, OSU Extension Services, US Forest Service, homeowners in Wildland/Urban Interface zones; Union County Fire Defense Board	
Potential Funding Sources:		Estimated cost:	Timeline:
			Ongoing
Form Submitted by:	Union County		
Action Item Status:	Revised and updated (2021) retained from 2013		

Appendix B: Planning Process

- **Meeting:** Union County Natural Hazard Mitigation Meeting - March 23, 2021
- **Time:** 10:00 am – 11:00 am
- **Location:** Virtual Zoom Meeting due to COVID restrictions
- **Agenda:**
 - Welcome and Introductions
 - Review purpose and scope of Natural Hazard Mitigation Plan
 - Draft Plan
 - Hazard Vulnerability Analysis
 - Mitigation Action Items
 - Next Steps
 - Good of the Order

Meeting announcement was emailed to the following:

March 23, 2021 NHMP Meeting	
4H & Extension District	Darrin Walenta
American Red Cross	Heather Stanhope
Avista Natural Gas	Greg Ford
Center for Human Development	George Thompson
Cove Fire Chief	Scott Loree
Cove Public Works Director	Dave Johnson
Cove Recorder	Donna Lewis
Cove Schools Superintendent	Earl Pettit
Elgin Administrator	Allan Duffy
Elgin Fire Chief	Kevin Silvernail
Elgin Public Works Director	Dan Larman
Elgin Schools Superintendent	Dianne Greif
EONI - Telephone/Internet	Jeff Crews
EOU VP University Advancement	Tim Seydel
Grande Ronde Hospital	April Brock
Imbler Fire Chief	Mike Barry
Imbler Recorder	Terrie Teeter
Imbler Schools Superintendent	Angie Lackey-Campbell
Island City Administrator	Karen Howton
La Grande Administrator	Robert Strobe
La Grande Chief of Police	Gary Bell
La Grande Fire Chief	Emmitt Cornford
La Grande Planner	Mike Boquist

La Grande Public Works Director	Kyle Carpenter
La Grande Rural Fire Chief	Craig Kretschmer
La Grande Schools Superintendent	George Mendoza
Life Flight	Peter Benjamin
North Powder Fire Chief	Colby Thompson
North Powder Public Works Director	Jim Hebert
North Powder Recorder	Beth Wendt
North Powder Schools Superintendent	Lance Dixon
Oregon Department of Fish & Wildlife	Nick Myatt
Oregon Department of Forestry	Logan McCrae
Oregon Department of Transportation	Ace Clark
Oregon Trail Electric Cooperative	Ned Ratterman
Summerville Mayor	Sheri Rogers
Union Administrator	Doug Wiggins
Union County Emergency Manager	JB Brock
Union County Emergency Services	Annette Powers
Union County Planning Director	Scott Hartell
Union County Public Works Director	Doug Wright
Union County Sheriff	Cody Bowen
Union County Soil & Water Conservation District	Jim Webster
Union Fire Chief	Tod Hull
Union Schools Superintendent	Carter Wells
Ziplay - Telephone/Internet	Tyson Brooks

March 23, 2021 meeting attendees:

March 23, 2021 NHMP Meeting Attendees	
American Red Cross	Heather Stanhope
Center for Human Development	George Thompson
Cove Public Works Director	Dave Johnson
Grande Ronde Hospital	April Brock
La Grande Chief of Police	Gary Bell
La Grande Fire Chief	Emmitt Cornford
La Grande Public Works Director	Kyle Carpenter
La Grande Rural Fire Chief	Craig Kretschmer
Oregon Department of Forestry	Logan McCrae
Oregon Department of Forestry	Mitch Williams
Oregon Department of Transportation	Cole Rohan
Union County Emergency Manager	JB Brock
Union County Emergency Services	Annette Powers
Union County Sheriff	Cody Bowen
Union County Soil & Water Conservation District	Jim Webster

Annette Powers

From: Annette Powers <apowers@union-county.org>
Sent: Thursday, March 11, 2021 4:12 PM
To: Angie Lakey-Campbell (angie.lakey-campbell@imblersd.org); April Brock; Beth Wendt; 'Bill Benson'; Brock April (ams02@grh.org); Carter Wells (carter.wells@unionsd5.org); cityadm@cityofelginor.org; 'CLARK Ace W'; Cody Bower; Colby Thompson; Craig Kretschmer; Dan Larman (publicworks@cityofelginor.org); Darrin Walenta; Dave Johnson; 'Dennis Hackney'; Dianne Greif (dianne.greif@elginsd.org); Doug Wiggins; 'Doug Wright'; Earl Pettit; Gary Bell (GBell@cityoflagrande.org); George Mendoza; George Thompson; Greg Ford; 'Greg Keller (gkeller@cityoflagrande.org)'; Heather Stanhope; 'J. B. Brock (jbrock@union-county.org)'; Jeff Crews; Jim Webster; Karen Howton; Kevin Silvermail; Kyle Carpenter; Lance Dixon (lance.dixon@npowdersd.org); Lewis, Donna; MCCRAE Logan * ODF; 'Mike Boquist'; mpbarry1@gmail.com; Ned Ratterman; Nick Myatt; Peter Benjamin; Robert Strobe; 'Scott Hartell (shartell@union-county.org)'; Scott Loree; Sheri Rogers; Terrie Teeter (imblcity@oregonwireless.net); Tim Seydel (tim.seydel@you.edu); Todd Hull; Tyson Brooks
Subject: Union County Natural Hazard Mitigation Plan

Union County is required to have an updated Natural Hazard Mitigation Plan, approved by the county, Oregon Emergency Management, and FEMA. A natural hazards mitigation plan (NHMP) identifies hazards, vulnerabilities, and risks facing local, state, or tribal government, and prioritizes actions to reduce the risks.

The former NHMP, approved in 2014, was a very large regional plan which included Baker, Grant, Wallowa, and Union counties. Regional discussions about the four-county plan resulted in each county developing their own plan for the state-required update. The Union County plan is a draft version which is now ready for government entities, service providers, and special districts to provide input should they choose to do so.

A meeting will be held via Zoom on Tuesday, March 23 at 10:00 a.m. to discuss this process. Participation is by no means mandatory, and this will not be the only meeting held regarding the update. One of the first steps will include a hazard analysis, which provides a county-wide picture of local natural hazards and risk assessments. This will be discussed in further detail at the meeting.

You are welcome to invite others within your organization as appropriate.

Zoom meeting information:

Topic: Union County Natural Hazard Mitigation Plan Meeting

Time: Mar 23, 2021 10:00 AM Pacific Time (US and Canada)

Join Zoom Meeting

<https://us02web.zoom.us/j/84303693998?pwd=QTFkR1FwWjRlR0N0WmQ2dWVWbENhQT09>

Meeting ID: 843 0369 3998

Passcode: 627150

Or Dial:

+1 346 248 7799 – or –

+1 669 900 6833

Annette Powers
Sr Dept Specialist II
Union County Commissioners & Emergency Services
1106 K Avenue
La Grande, OR 97850
(541) 963-1001
apowers@union-county.org

- **Meeting:** NHMP Goals, Actions, Maintenance and Implementation – April 27, 2021
- **Time:** 10:00 am – 11:00 am
- **Location:** Virtual Zoom Meeting
- **Agenda:**
 - Welcome & Introductions
 - Hazard Vulnerability Analysis Results
 - Mitigation Action items
 - Next Steps
 - Next Meeting Date
 - Good of the Order
 - Adjourn

Meeting announcement was emailed to the following:

April 27, 2021 NHMP Meeting	
4H & Extension District	Darrin Walenta
American Red Cross	Heather Stanhope
Avista Natural Gas	Greg Ford
Center for Human Development	George Thompson
Center for Human Development	Carrie Brogoitti
Cove Fire Chief	Scott Loree
Cove Public Works Director	Dave Johnson
Cove Recorder	Donna Lewis
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La Grande Planner	Mike Boquist
La Grande Public Works Director	Kyle Carpenter
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North Powder Fire Chief	Colby Thompson
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Oregon Department of Fish & Wildlife	Nick Myatt
Oregon Department of Forestry	Mitch Williams
Oregon Department of Forestry	Logan McCrae
Oregon Department of Transportation	Ace Clark
Oregon Department of Transportation	Sean Rohan
Oregon Trail Electric Cooperative	Ned Ratterman
Summerville Mayor	Sheri Rogers
Union Administrator	Doug Wiggins
Union County Emergency Manager	JB Brock
Union County Emergency Services	Annette Powers
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Union County Public Works Director	Doug Wright
Union County Sheriff	Cody Bowen
Union County Soil & Water Conservation District	Jim Webster
Union Fire Chief	Tod Hull
Union Schools Superintendent	Carter Wells
Ziply - Telephone/Internet	Tyson Brooks
April 27, 2021 NHMP Meeting Attendees	
American Red Cross	Heather Stanhope
Cove Public Works Director	Dave Johnson
La Grande Chief of Police	Gary Bell
La Grande Fire Chief	Emmitt Cornford
La Grande Public Works Director	Kyle Carpenter
La Grande Rural Fire Chief	Craig Kretschmer
Oregon Department of Forestry	Logan McCrae
Oregon Department of Forestry	Mitch Williams
Oregon Department of Transportation	Sean Rohan
Union County Emergency Manager	JB Brock
Union County Emergency Services	Annette Powers
City of Union Administrator	Doug Wiggins
Avista Natural Gas	Greg Ford
Ziply Fiber	Diana Anderson
Elgin School District	Dianne Greif
Imbler Fire Chief	Mike Barry
La Grande Administrator	Robert Strobe

Annette Powers

Subject: Natural Hazard Mitigation Meeting
Location: Virtual

Start: Tue 4/27/2021 10:00 AM
End: Tue 4/27/2021 11:00 AM
Show Time As: Tentative

Recurrence: (none)

Meeting Status: Not yet responded

Organizer: Annette Powers
Required Attendees: Allan Duffy; Angie Lakey Campbell (angie.lakey.campbell@imblersd.org); April Brock; Beth Wendt; Bill Benson; Biogotti Carrie; Carter Wells (carter.wells@unionsd5.org); CLARK Ace W; Cody Bowen; Colby Thompson; Cornford Emmitt (ecornford@cityoflagrande.org); Craig Kretschmer; Dan Lamman (publicworks@cityofelginor.org); Darin Walenta; Dave Johnson; Dianne Greif (dianne.greif@elgin.sd.org); Doug Wiggins; Doug Wright; Earl Pettit; Gary Bell (GBell@cityoflagrande.org); George Mendoza; George Thompson; Greg Ford; Heather Stanhope; J. B. Brock (jbrock@union-county.org); Jeff Crews; Jim Webster; Karen Howton; Kevin Silvernail; Kyle Carpenter; Lance Dixon (lance.dixon@npowdersd.org); Lewis, Donna; MCCRAE Logan * ODF; Mike Boquist; Mitch Williams (mitchwilliams@oregon.gov; mpbarry1@gmail.com; Ned Ratterman; Nick Myatt; Peter Benjamin; Robert Strope; Scott Hartell (shartell@union-county.org); Scott Loree; Sean Rohan; Sheri Rogers; Terrie Taeter (imblecity@oregonwireless.net); Tim Seydel (tim.seydel@eou.edu); Todd Hull; Tyson Brooks

Hello – Union County Emergency Services will be holding a Natural Hazard Mitigation meeting on Tuesday, April 27 at 10:00 a.m. The agenda is attached. If you have any questions about this information, please let me know.

Join Zoom Meeting:
<https://us02web.zoom.us/j/84303693998?pwd=QTdFRlFxaWpIRGNOWmM2dWVWdENYQT09>

Meeting ID: 843 0369 3998
Passcode: 827150

Or – Dial +1-346-248-7799

Annette Powers
Gr Dept Specialist II
Union County Commissioner & Emergency Services
1106 K Avenue
La Grande, OR 97850
(541) 963-1001
apowers@union-county.org

- **Meeting:** NHMP - **DATE** TBD
- **Time:** TBD
- **Location:** TBD
- **Agenda:**
 - Natural Hazard Mitigation Plan Update
 - Adjourn

Meeting announcement, list of invitees, and list of attendees to be inserted here.

Meeting announcement was emailed to the following:

xxx

Meeting attendees to be inserted here.

xxx

Copy of email for meeting to be inserted here.

FOR IMMEDIATE RELEASE
October 18, 2021

Union County updates Natural Hazard Mitigation Plan

Union County is currently in the process of updating the Union County Natural Hazard Mitigation Plan (NHMP). The plan allows the participating jurisdictions eligibility to apply for federal funding towards natural hazard mitigation projects. The local planning process included a wide range of representatives from city and county government, emergency management personnel, school districts, utility companies, public health, hospital, and special districts within the county.

A natural hazard mitigation plan provides goals, action items, and resources designed to reduce future natural disaster risk. Engaging in mitigation activities provides jurisdictions with a number of benefits, including reduced short and long-term recovery and reconstruction costs, as well as increased potential for state and federal funding for recovery and reconstruction projects.

A draft version of the Union County Natural Hazard Mitigation Plan will be available for public comment until October 29, 2021. The plan may be reviewed at www.union-county.org/emergency-services/ and comments may be submitted to em@union-county.org.

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Appendix C: Grant Programs

Hazard Mitigation Programs

Post-Disaster Federal Programs

- Hazard Mitigation Grant Program
 - The Hazard Mitigation Grant Program (HMGP) provides grants to States and local governments to implement long-term hazard mitigation measures after a major disaster declaration. The purpose of the HMGP is to reduce the loss of life and property due to natural disasters and to enable mitigation measures to be implemented during the immediate recovery from a disaster. The HMGP is authorized under Section 404 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act.
 - <http://www.fema.gov/government/grant/hmgrp/>
- Physical Disaster Loan Program
 - When physical disaster loans are made to homeowners and businesses following disaster declarations by the U.S. Small Business Administration (SBA), up to 20% of the loan amount can go towards specific measures taken to protect against recurring damage in similar future disasters.
 - <http://www.sba.gov/services/disasterassistance/index.html>

Pre-Disaster Federal Programs

- Pre-Disaster Mitigation Grant Program
 - The Pre-Disaster Mitigation (PDM) program provides funds to states, territories, Indian tribal governments, communities, and universities for hazard mitigation planning and the implementation of mitigation projects prior to a disaster event. Funding these plans and projects reduces overall risks to the population and structures, while also reducing reliance on funding from actual disaster declarations. PDM grants are to be awarded on a competitive basis and without reference to state allocations, quotas, or other formula-based allocation of funds.
 - <http://www.fema.gov/government/grant/pdm/index.shtm>
- Flood Mitigation Assistance Program
 - The overall goal of the Flood Mitigation Assistance (FMA) Program is to fund cost-effective measures that reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes, and other National Flood Insurance Program (NFIP) insurable structures. This specifically includes:
 - Reducing the number of repetitively or substantially damaged structures and the associated flood insurance claims;
 - Encouraging long-term, comprehensive hazard mitigation planning;
 - Responding to the needs of communities participating in the NFIP to expand their mitigation activities beyond floodplain development activities; and
 - Complementing other federal and state mitigation programs with similar, long-term mitigation goals.
 - <http://www.fema.gov/government/grant/fma/index.shtm>

State Programs

- Community Development Block Grant Program
 - Promotes viable communities by providing: 1) decent housing; 2) quality living environments; and 3) economic opportunities, especially for low and moderate income persons. Eligible Activities Most Relevant to Hazard Mitigation include: acquisition of property for public purposes; construction/reconstruction of public infrastructure; community planning activities. Under special circumstances, CDBG funds also can be used to meet urgent community

development needs arising in the last 18 months which pose immediate threats to health and welfare.

- <http://www.hud.gov/offices/cpd/communitydevelopment/programs/>
- Oregon Watershed Enhancement Board
- While OWEB's primary responsibilities are implementing projects addressing coastal salmon restoration and improving water quality statewide, these projects can sometimes also benefit efforts to reduce flood and landslide hazards. In addition, OWEB conducts watershed workshops for landowners, watershed councils, educators, and others, and conducts a biennial conference highlighting watershed efforts statewide. Funding for OWEB programs comes from the general fund, state lottery, timber tax revenues, license plate revenues, angling license fees, and other sources. OWEB awards approximately \$20 million in funding annually.
- <http://www.oweb.state.or.us/>

Federal Mitigation Programs, Activities & Initiatives

Basic & Applied Research/Development

- National Earthquake Hazard Reduction Program (NEHRP), National Science Foundation. Through broad based participation, the NEHRP attempts to mitigate the effects of earthquakes. Member agencies in NEHRP are the US Geological Survey (USGS), the National Science Foundation (NSF), the Federal Emergency Management Agency (FEMA), and the National Institute for Standards and Technology (NIST). The agencies focus on research and development in areas such as the science of earthquakes, earthquake performance of buildings and other structures, societal impacts, and emergency response and recovery. <http://www.nehrp.gov/>
- Decision, Risk, and Management Science Program, National Science Foundation. Supports scientific research directed at increasing the understanding and effectiveness of decision making by individuals, groups, organizations, and society. Disciplinary and interdisciplinary research, doctoral dissertation research, and workshops are funded in the areas of judgment and decision making; decision analysis and decision aids; risk analysis, perception, and communication; societal and public policy decision making; management science and organizational design. The program also supports small grants for exploratory research of a time-critical or high-risk, potentially transformative nature. http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5423&org=SES

Hazard ID and Mapping

- National Flood Insurance Program: Flood Mapping; FEMA. Flood insurance rate maps and flood plain management maps for all NFIP communities. <http://www.fema.gov/plan/prevent/fhm/index.shtm>
- National Digital Orthophoto Program, DOI – USGS. Develops topographic quadrangles for use in mapping of flood and other hazards. <http://www.ndop.gov/>
- Mapping Standards Support, DOI-USGS. Expertise in mapping and digital data standards to support the National Flood Insurance Program. <http://ncgmp.usgs.gov/ncgmpstandards/>
- Soil Survey, USDA-NRCS. Maintains soil surveys of counties or other areas to assist with farming, conservation, mitigation or related purposes. <http://soils.usda.gov/survey/>

Project Support

- Coastal Zone Management Program, NOAA. Provides grants for planning and implementation of non-structural coastal flood and hurricane hazard mitigation projects and coastal wetlands restoration. <http://coastalmanagement.noaa.gov/>
- Community Development Block Grant Entitlement Communities Program, HUD. Provides grants to entitled cities and urban counties to develop viable communities (*e.g.* decent housing, a suitable living environment, expanded economic opportunities), principally for low- and moderate- income persons. <http://www.hud.gov/offices/cpd/communitydevelopment/programs/entitlement/>
- National Fire Plan (DOI – USDA) Provides technical, financial, and resource guidance and support for wildland fire management across the United States. Addresses five key points: firefighting, rehabilitation, hazardous fuels reduction, community assistance, and accountability. <http://www.forestsandrangelands.gov/NFP/index.shtml>
- Assistance to Firefighters Grant Program, FEMA. Grants are awarded to fire departments to enhance their ability to protect the public and fire service personnel from fire and related hazards. Three types of grants are available: Assistance to Firefighters Grant (AFG), Fire Prevention and Safety (FP&S), and Staffing for Adequate Fire and Emergency Response (SAFER). <http://www.firegrantsupport.com/>
- Emergency Watershed Protection Program, USDA-NRCS. Provides technical and financial assistance for relief from imminent hazards in small watersheds, and to reduce vulnerability of life and property in small watershed areas damaged by severe natural hazard events. <http://www.nrcs.usda.gov/programs/EWP/>
- Rural Development Assistance – Utilities, USDA. Direct and guaranteed rural economic loans and business enterprise grants to address utility issues and development needs. <http://www.usda.gov/rus/>
- Rural Development Assistance – Housing, USDA. Grants, loans, and technical assistance in addressing rehabilitation, health and safety needs in primarily low-income rural areas. Declaration of major disaster necessary. <http://www.rurdev.usda.gov/rhs/>
- Public Assistance Grant Program, FEMA. The objective of the Federal Emergency Management Agency's (FEMA) Public Assistance (PA) Grant Program is to provide assistance to State, Tribal and local governments, and certain types of Private Nonprofit organizations so that communities can quickly respond to and recover from major disasters or emergencies declared by the President. <http://www.fema.gov/government/grant/pa/index.shtm>
- National Flood Insurance Program, FEMA. Makes available flood insurance to residents of communities that adopt and enforce minimum floodplain management requirements. <http://www.fema.gov/business/nfip/>
- HOME Investments Partnerships Program, HUD. Grants to states, local government and consortia for permanent and transitional housing (including support for property acquisition and rehabilitation) for low-income persons. <http://www.hud.gov/offices/cpd/affordablehousing/programs/home/>
- Disaster Recovery Initiative, HUD. Grants to fund gaps in available recovery assistance after disasters (including mitigation). <http://www.hud.gov/offices/cpd/communitydevelopment/programs/dri/driquickfacts.cfm>
- Emergency Management Performance Grants, FEMA. Helps state and local governments to sustain and enhance their all-hazards emergency management programs. <http://www.fema.gov/government/grant/empg/index.shtm#0>
- Partners for Fish and Wildlife, DOI – FWS. Financial and technical assistance to private landowners interested in pursuing restoration projects affecting wetlands and riparian habitats. <http://www.fws.gov/partners/>

- North American Wetland Conservation Fund, DOI-FWS. Cost-share grants to stimulate public/private partnerships for the protection, restoration, and management of wetland habitats. <http://www.doi.gov/partnerships/wetlands.html>
- Federal Land Transfer / Federal Land to Parks Program, DOI-NPS. Identifies, assesses, and transfers available Federal real property for acquisition for State and local parks and recreation, such as open space. http://www.nps.gov/ncrc/programs/flp/flp_questions.html
- Wetlands Reserve program, USDA-NCRS. Financial and technical assistance to protect and restore wetlands through easements and restoration agreements. <http://www.nrcs.usda.gov/Programs/WRP/>
- Secure Rural Schools and Community Self-Determination Act of 2000, US Forest Service. Reauthorized for FY2008-2011, it was originally enacted in 2000 to provide five years of transitional assistance to rural counties affected by the decline in revenue from timber harvests on federal lands. Funds have been used for improvements to public schools, roads, and stewardship projects. Money is also available for maintaining infrastructure, improving the health of watersheds and ecosystems, protecting communities, and strengthening local economies. <http://www.fs.fed.us/srs/>
More resources at: <http://www.oregonshowcase.org/stateplan/part4>

Appendix D: Economic Analysis of Natural Hazard Mitigation Projects

This appendix was developed by the Oregon Partnership for Disaster Resilience at the University of Oregon's Community Service Center. It has been reviewed and accepted by the Federal Emergency Management Agency as a means of documenting how the prioritization of actions shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.

The appendix outlines three approaches for conducting economic analyses of natural hazard mitigation projects. It describes the importance of implementing mitigation activities, different approaches to economic analysis of mitigation strategies, and methods to calculate costs and benefits associated with mitigation strategies. Information in this section is derived in part from: The Interagency Hazards Mitigation Team, *State Hazard Mitigation Plan*, (Oregon State Police – Office of Emergency Management, 2000), and Federal Emergency Management Agency Publication 331, *Report on Costs and Benefits of Natural Hazard Mitigation*.

This section is not intended to provide a comprehensive description of benefit/cost analysis, nor is it intended to evaluate local projects. It is intended to (1) raise benefit/cost analysis as an important issue, and (2) provide some background on how economic analysis can be used to evaluate mitigation projects.

Why Evaluate Mitigation Strategies?

Mitigation activities reduce the cost of disasters by minimizing property damage, injuries, and the potential for loss of life, and by reducing emergency response costs, which would otherwise be incurred. Evaluating possible natural hazard mitigation activities provides decision-makers with an understanding of the potential benefits and costs of an activity, as well as a basis upon which to compare alternative projects.

Evaluating mitigation projects is a complex and difficult undertaking, which is influenced by many variables. First, natural disasters affect all segments of the communities they strike, including individuals, businesses, and public services such as fire, police, utilities, and schools. Second, while some of the direct and indirect costs of disaster damages are measurable, some of the costs are non-financial and difficult to quantify in dollars.

Third, many of the impacts of such events produce “ripple-effects” throughout the community, greatly increasing the disaster's social and economic consequences.

While not easily accomplished, there is value, from a public policy perspective, in assessing the positive and negative impacts from mitigation activities, and obtaining an instructive benefit/cost comparison.

Otherwise, the decision to pursue or not pursue various mitigation options would not be based on an objective understanding of the net benefit or loss associated with these actions.

What are some Economic Analysis Approaches for Evaluating Mitigation Strategies?

The approaches used to identify the costs and benefits associated with natural hazard mitigation strategies, measures, or projects fall into three general categories: benefit/cost analysis, cost-effectiveness analysis and the STAPLE/E approach. The distinction between the three methods is outlined below:

Benefit/Cost Analysis

Benefit/cost analysis is a key mechanism used by the state Office of Emergency Management (OEM), the Federal Emergency Management Agency, and other state and federal agencies in evaluating hazard mitigation projects, and is required by the Robert T. Stafford Disaster Relief and Emergency Assistance Act, Public Law 93-288, as amended.

Benefit/cost analysis is used in natural hazard mitigation to show if the benefits to life and property protected through mitigation efforts exceed the cost of the mitigation activity. Conducting benefit/cost analysis for a mitigation activity can assist communities in determining whether a project is worth undertaking now, in order to avoid disaster-related damages later. Benefit/cost analysis is based on calculating the frequency and severity of a hazard, avoiding future damages, and risk. In benefit/cost analysis, all costs and benefits are evaluated in terms of dollars, and a net benefit/cost ratio is computed to determine whether a project should be implemented. A project must have a benefit/cost ratio greater than 1 (*i.e.* the net benefits will exceed the net costs) to be eligible for FEMA funding.

Cost-Effectiveness Analysis

Cost-effectiveness analysis evaluates how best to spend a given amount of money to achieve a specific goal. This type of analysis, however, does not necessarily measure costs and benefits in terms of dollars. Determining the economic feasibility of mitigating natural hazards can also be organized according to the perspective of those with an economic interest in the outcome. Hence, economic analysis approaches are covered for both public and private sectors as follows.

Investing in Public Sector Mitigation Activities

Evaluating mitigation strategies in the public sector is complicated because it involves estimating all of the economic benefits and costs regardless of who realizes them, and potentially to a large number of people and economic entities. Some benefits cannot be evaluated monetarily, but still affect the public in profound ways. Economists have developed methods to evaluate the economic feasibility of public decisions which involve a diverse set of beneficiaries and non-market benefits.

Investing in Private Sector Mitigation Activities

Private sector mitigation projects may occur on the basis of one or two approaches: it may be mandated by a regulation or standard, or it may be economically justified on its own merits. A building or landowner, whether a private entity or a public agency, required to conform to a mandated standard may consider the following options:

- Request cost sharing from public agencies;
- Dispose of the building or land either by sale or demolition;
- Change the designated use of the building or land and change the hazard mitigation compliance requirement; or
- Evaluate the most feasible alternatives and initiate the most cost effective hazard mitigation alternative.

The sale of a building or land triggers another set of concerns. For example, real estate disclosure laws can be developed which require sellers of real property to disclose known defects and deficiencies in the property, including earthquake weaknesses and hazards to prospective purchases.

Correcting deficiencies can be expensive and time consuming, but their existence can prevent the sale of the building. Conditions of a sale regarding the deficiencies and the price of the building can be negotiated between a buyer and seller.

STAPLE/E Approach

Considering detailed benefit/cost or cost-effectiveness analysis for every possible mitigation activity could be very time consuming and may not be practical. There are some alternate approaches for conducting a quick evaluation of the proposed mitigation activities which could be used to identify those mitigation activities that merit more detailed assessment.

One of those methods is the STAPLE/E approach.

Using STAPLE/E criteria, mitigation activities can be evaluated quickly by steering committees in a synthetic fashion. This set of criteria requires the Steering Committee to assess the mitigation activities based on the Social, Technical, Administrative, Political, Legal, Economic and Environmental (STAPLE/E) constraints and opportunities of implementing the particular mitigation item in your community. The second chapter in FEMA's How-To Guide "Developing the Mitigation Plan - Identifying Mitigation Actions and Implementation Strategies" as well as the "State of Oregon's Local Natural Hazard Mitigation Plan: An Evaluation Process" outline some specific considerations in analyzing each aspect. The following are suggestions for how to examine each aspect of the STAPLE/E approach from the "State of Oregon's Local Natural Hazard Mitigation Plan: An Evaluation Process."

Social: Community development staff, local non-profit organizations, or a local planning board can help answer these questions.

- Is the proposed action socially acceptable to the community?
- Are there equity issues involved that would mean that one segment of the community is treated unfairly?
- Will the action cause social disruption

Technical: The city or county public works staff, and building department staff can help answer these questions.

- Will the proposed action work?
- Will it create more problems than it solves?
- Does it solve a problem or only a symptom?
- Is it the most useful action in light of other community goals?

Administrative: Elected officials or the county administrator, can help answer these questions.

- Can the community implement the action?
- Is there someone to coordinate and lead the effort?
- Is there sufficient funding, staff, and technical support available?
- Are there ongoing administrative requirements that need to be met?

Political: Consult the mayor, city council or county planning commission, city or county administrator, and local planning commissions to help answer these questions.

- Is the action politically acceptable?
- Is there public support both to implement and to maintain the project?

Legal: Include legal counsel, land use planners, risk managers, and city council or county planning commission members, among others, in this discussion.

- Is the community authorized to implement the proposed action? Is there a clear legal basis or precedent for this activity?
- Are there legal side effects? Could the activity be construed as a taking?
- Is the proposed action allowed by the comprehensive plan, or must the comprehensive plan be amended to allow the proposed action?
- Will the community be liable for action or lack of action?
- Will the activity be challenged?

Economic: Community economic development staff, civil engineers, building department staff, and the assessor's office can help answer these questions.

- What are the costs and benefits of this action?
- Do the benefits exceed the costs?
- Are initial, maintenance, and administrative costs taken into account?

- Has funding been secured for the proposed action? If not, what are the potential funding sources (public, non-profit, and private?)
- How will this action affect the fiscal capability of the community?
 - What burden will this action place on the tax base or local economy?
 - What are the budget and revenue effects of this activity?
 - Does the action contribute to other community goals, such as capital improvements or economic development?
 - What benefits will the action provide? (This can include dollar amount of damages prevented, number of homes protected, credit under the CRS, potential for funding under the HMGP or the FMA program, etc.)

Environmental: Watershed councils, environmental groups, land use planners and natural resource managers can help answer these questions.

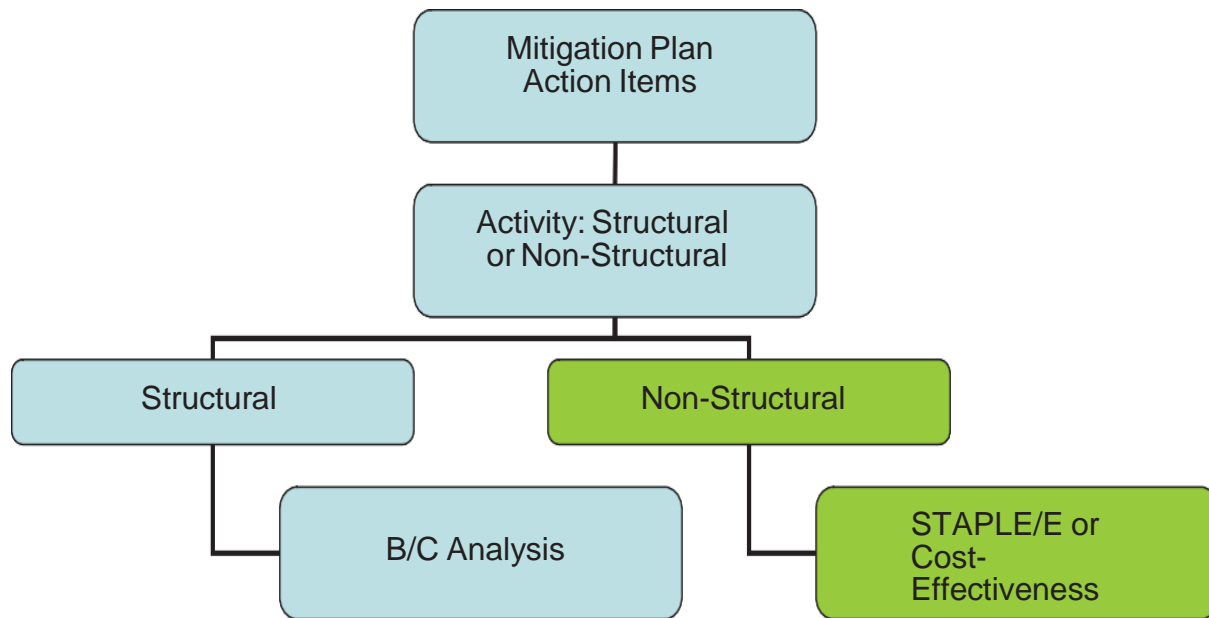
- How will the action impact the environment?
- Will the action need environmental regulatory approvals?
- Will it meet local and state regulatory requirements?
- Are endangered or threatened species likely to be affected?

The STAPLE/E approach is helpful for doing a quick analysis of mitigation projects. Most projects that seek federal funding and others often require more detailed benefit/cost analyses.

When to use the Various Approaches

It is important to realize that various funding sources require different types of economic analyses. The following figure is to serve as a guideline for when to use the various approaches.

Figure D.1: Economic Analysis Flowchart



Implementing the Approaches

Benefit/cost analysis, cost-effectiveness analysis, and the STAPLE/E are important tools in evaluating whether or not to implement a mitigation activity. A framework for evaluating mitigation activities is outlined below. This framework should be used in further analyzing the feasibility of prioritized mitigation activities.

1. Identify the Activities

Activities for reducing risk from natural hazards can include structural projects to enhance disaster resistance, education and outreach, and acquisition or demolition of exposed properties, among others. Different mitigation projects can assist in minimizing risk to natural hazards, but do so at varying economic costs.

2. Calculate the Costs and Benefits

Choosing economic criteria is essential to systematically calculating costs and benefits of mitigation projects and selecting the most appropriate activities. Potential economic criteria to evaluate alternatives include:

- **Determine the project cost.** This may include initial project development costs, and repair and operating costs of maintaining projects over time.
- **Estimate the benefits.** Projecting the benefits, or cash flow resulting from a project can be difficult. Expected future returns from the mitigation effort depend on the

correct specification of the risk and the effectiveness of the project, which may not be well known. Expected future costs depend on the physical durability and potential economic obsolescence of the investment. This is difficult to project. These considerations will also provide guidance in selecting an appropriate salvage value. Future tax structures and rates must be projected. Financing alternatives must be researched, and they may include retained earnings, bond and stock issues, and commercial loans.

- **Consider costs and benefits to society and the environment.** These are not easily measured, but can be assessed through a variety of economic tools including existence value or contingent value theories. These theories provide quantitative data on the value people attribute to physical or social environments. Even without hard data, however, impacts of structural projects to the physical environment or to society should be considered when implementing mitigation projects.
- **Determine the correct discount rate.** Determination of the discount rate can just be the risk-free cost of capital, but it may include the decision maker's time preference and also a risk premium. Including inflation should also be considered.

3. Analyze and Rank the Activities

Once costs and benefits have been quantified, economic analysis tools can rank the possible mitigation activities. Two methods for determining the best activities given varying costs and benefits include net present value and internal rate of return.

- **Net present value.** Net present value is the value of the expected future returns of an investment minus the value of the expected future cost expressed in today's dollars. If the net present value is greater than the projected costs, the project may be determined feasible for implementation. Selecting the discount rate, and identifying the present and future costs and benefits of the project calculates the net present value of projects.
- **Internal rate of return.** Using the internal rate of return method to evaluate mitigation projects provides the interest rate equivalent to the dollar returns expected from the project. Once the rate has been calculated, it can be compared to rates earned by investing in alternative projects. Projects may be feasible to implement when the internal rate of return is greater than the total costs of the project. Once the mitigation projects are ranked on the basis of economic criteria, decision-makers can consider other factors, such as risk, project effectiveness, and economic, environmental, and social returns in choosing the appropriate project for implementation.

Economic Returns of Natural Hazard Mitigation

The estimation of economic returns, which accrue to building or land owners as a result of natural hazard mitigation, is difficult. Owners evaluating the economic feasibility of mitigation should consider reductions in physical damages and financial losses. A partial list follows:

- Building damages avoided
- Content damages avoided
- Inventory damages avoided
- Rental income losses avoided
- Relocation and disruption expenses avoided
- Proprietor's income losses avoided

These parameters can be estimated using observed prices, costs, and engineering data. The difficult part is to correctly determine the effectiveness of the hazard mitigation project and the resulting reduction in damages and losses. Equally as difficult is assessing the probability that an event will occur. The damages and losses should only include those that will be borne by the owner. The salvage value of the investment can be important in determining economic feasibility. Salvage value becomes more important as the time horizon of the owner declines. This is important because most businesses depreciate assets over a period of time.

Additional Costs from Natural Hazards

Property owners should also assess changes in a broader set of factors that can change as a result of a large natural disaster. These are usually termed “indirect” effects, but they can have a very direct effect on the economic value of the owner's building or land. They can be positive or negative, and include changes in the following:

- Commodity and resource prices
- Availability of resource supplies
- Commodity and resource demand changes
- Building and land values
- Capital availability and interest rates
- Availability of labor
- Economic structure
- Infrastructure
- Regional exports and imports
- Local, state, and national regulations and policies
- Insurance availability and rates

Changes in the resources and industries listed above are more difficult to estimate and require models that are structured to estimate total economic impacts. Total economic impacts are the sum of direct and indirect economic impacts. Total economic impact models are usually not combined with economic feasibility models. Many models exist to estimate total economic impacts of changes in an economy. Decision makers should understand the total economic impacts of natural disasters in order to calculate the benefits of a mitigation activity. This suggests that understanding the local economy is an important first step in being able to understand the potential impacts of a disaster, and the benefits of mitigation activities.

Additional Considerations

Conducting an economic analysis for potential mitigation activities can assist decision-makers in choosing the most appropriate strategy for their community to reduce risk and prevent loss from natural hazards.

Economic analysis can also save time and resources from being spent on inappropriate or unfeasible projects. Several resources and models are listed on the following page that can assist in conducting an economic analysis for natural hazard mitigation activities.

Benefit/cost analysis is complicated, and the numbers may divert attention from other important issues. It is important to consider the qualitative factors of a project associated with mitigation that cannot be evaluated economically. There are alternative approaches to implementing mitigation projects. With this in mind, opportunity rises to develop strategies that integrate natural hazard mitigation with projects related to watersheds, environmental planning, community economic development, and small business development, among others. Incorporating natural hazard mitigation with other community projects can increase the viability of project implementation.

Resources

CUREe Kajima Project, *Methodologies for Evaluating the Socio-Economic Consequences of Large Earthquakes*, Task 7.2 Economic Impact Analysis, Prepared by University of California, Berkeley Team, Robert A. Olson, VSP Associates, Team Leader; John M. Eiding, G&E Engineering Systems; Kenneth A. Goettel, Goettel and Associates, Inc.; and Gerald L. Horner, Hazard Mitigation Economics Inc., 1997

Federal Emergency Management Agency, *Benefit/Cost Analysis of Hazard Mitigation Projects*, Riverine Flood, Version 1.05, Hazard Mitigation Economics, Inc., 1996

Federal Emergency Management Agency, *Report on the Costs and Benefits of Natural Hazard Mitigation*. Publication 331, 1996.

Goettel & Horner Inc., *Earthquake Risk Analysis Volume III: The Economic Feasibility of Seismic Rehabilitation of Buildings in the City of Portland*, Submitted to the Bureau of Buildings, City of Portland, August 30, 1995.

Goettel & Horner Inc., *Benefit/Cost Analysis of Hazard Mitigation Projects Volume V, Earthquakes*, Prepared for FEMA's Hazard Mitigation Branch, October 25, 1995.

Horner, Gerald, *Benefit/Cost Methodologies for Use in Evaluating the Cost Effectiveness of Proposed Hazard Mitigation Measures*, Robert Olsen Associates, Prepared for Oregon State Police, Office of Emergency Management, July 1999.

Interagency Hazards Mitigation Team, *State Hazard Mitigation Plan*, (Oregon State Police – Office of Emergency Management, 2000.)

Risk Management Solutions, Inc., *Development of a Standardized Earthquake Loss Estimation Methodology*, National Institute of Building Sciences, Volume I and II, 1994.

VSP Associates, Inc., *A Benefit/Cost Model for the Seismic Rehabilitation of Buildings*, Volumes 1 & 2, Federal Emergency management Agency, FEMA Publication Numbers 227 and 228, 1991.

VSP Associates, Inc., *Benefit/Cost Analysis of Hazard Mitigation Projects: Section 404 Hazard Mitigation Program and Section 406 Public Assistance Program, Volume 3: Seismic Hazard Mitigation Projects*, 1993.

VSP Associates, Inc., *Seismic Rehabilitation of Federal Buildings: A Benefit/Cost Model*, Volume 1, Federal Emergency Management Agency, FEMA Publication Number 255, 1994.

Appendix E: FEMA Review Tool

FEMA REGION 10 LOCAL MITIGATION PLAN REVIEW TOOL

The *Local Mitigation Plan Review Tool* demonstrates how the Local Mitigation Plan meets the regulation in [44 CFR §201.6](#) and offers States and FEMA Mitigation Planners an opportunity to provide feedback to participating jurisdictions.

1. The [Multi-Jurisdiction Summary Sheet](#) is used to document how each jurisdiction met the requirements in the Plan.
2. The [Regulation Checklist](#) provides a summary of FEMA’s evaluation of whether the Plan has addressed all requirements.
3. The [Plan Assessment](#) identifies the plan’s strengths as well as documents areas for future improvement.

The FEMA Mitigation Planner must reference the [Local Mitigation Plan Review Guide](#) when completing this *Local Mitigation Plan Review Tool*.

Jurisdiction: Union County, Oregon	Title of Plan: Union County Multijurisdictional Natural Hazard Mitigation Plan	Date of Plan: February, 2021
Local Point of Contact: Nick Vora Title: Emergency Manager	Address: 1106 K Avenue La Grande, OR 97850	
Agency: Union County		
Phone Number: 541-963-1009	E-Mail: nvora@union-county.org	

State Reviewer:	Title:	Date:

FEMA Reviewer:	Title:	Date:
Date Received in FEMA Region 10		
Plan Not Approved		
Plan Approvable Pending Adoption		
Plan Approved		

SECTION 1: MULTI-JURISDICTION SUMMARY SHEET (used only for multi-jurisdictional plans)

INSTRUCTIONS: The Multi-Jurisdiction Summary Spreadsheet is completed by listing each participating jurisdiction and which required Elements for each jurisdiction were ‘Met’ or ‘Not Met,’ and when the adoption resolutions were received. This Summary Sheet does not imply that a mini-plan be developed for each jurisdiction; it is used to ensure that each jurisdiction participating in the Plan has been documented and has met the requirements for those Elements (A through E).

MULTI-JURISDICTION SUMMARY SHEET (Add additional pages if necessary)										
#	Jurisdiction Name	Jurisdiction Type (city, district, etc.)	POC	Required Revisions / Comments	Requirements Met (Y/N)					
					A. Planning Process	B. Hazard Identification & Risk Assessment	C. Mitigation Strategy	D. Plan Review, Evaluation & Implementation	E. Plan Adoption	F. State Requirements
1	Union County	County	Nick Vora		Y	Y	Y	Y	Y	n/a

SECTION 2: REGULATION CHECKLIST

INSTRUCTIONS: The Regulation Checklist is completed by FEMA. The purpose of the Checklist is to identify the location of relevant or applicable content in the Plan by Element/sub-element and to determine if each requirement has been ‘Met’ or ‘Not Met.’ The ‘Required Revisions’ summary at the bottom of each Element is completed by FEMA to provide a clear explanation of the revisions that are required for plan approval. Required revisions are explained for each plan sub-element that is ‘Not Met.’ Sub-elements are referenced in each summary by using the appropriate numbers (A1, B3, etc.), where applicable.

1. REGULATION CHECKLIST	Location in Plan	Met	Not Met
Regulation (44 CFR 201.6 Local Mitigation Plans)	(section or page)		
ELEMENT A. PLANNING PROCESS			
A1. Does the Plan document the planning process, including how it was prepared and who was involved in the process for each jurisdiction? (Requirement §201.6(c)(1))	p. 4, 11-12		
A2. Does the Plan document an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, agencies that have the authority to regulate development as well as other interests to be involved in the planning process? (Requirement §201.6(b)(2))	p. 11-12		

1. REGULATION CHECKLIST		Location in Plan	Met	Not Met
Regulation (44 CFR 201.6 Local Mitigation Plans)		(section or page)		
A3. Does the Plan document how the public was involved in the planning process during the drafting stage? (Requirement §201.6(b)(1))		p. 11-13		
A4. Does the Plan describe the review and incorporation of existing plans, studies, reports, and technical information? (Requirement §201.6(b)(3))		p. 22-23		
A5. Is there discussion of how the communities will continue public participation in the plan maintenance process? (Requirement §201.6(c)(4)(iii))		p. 30-34		
A6. Is there a description of the method and schedule for keeping the plan current (monitoring, evaluating and updating the mitigation plan within a 5-year cycle)? (Requirement §201.6(c)(4)(i))		p. 30-34		
<u>ELEMENT A: REQUIRED REVISIONS</u>				
<u>ELEMENT B. HAZARD IDENTIFICATION AND RISK ASSESSMENT</u>				
B1. Does the Plan include a description of the type, location, and extent of all natural hazards that can affect each jurisdiction(s)? (Requirement §201.6(c)(2)(i))		Volume II beginning on page 38 Drought - p.41 Earthquake - p. 48 Flood - p.60 Landslide - p.70 Wildfire – p.80 Severe Weather – p.81		
B2. Does the Plan include information on previous occurrences of hazard events and on the probability of future hazard events for each jurisdiction? (Requirement §201.6(c)(2)(i))		Volume II beginning on page 38 Drought – p.44-45 Earthquake – p.49,55 Flood – p. 64,65,67 Landslide – p.72, 74 Wildfire – p.80 Severe Weather – p.83-87		

1. REGULATION CHECKLIST		Location in Plan	Met	Not Met
Regulation (44 CFR 201.6 Local Mitigation Plans)		(section or page)		
B3. Is there a description of each identified hazard’s impact on the community as well as an overall summary of the community’s vulnerability for each jurisdiction? (Requirement §201.6(c)(2)(ii))		Volume II beginning on p.38 Drought – p.45-46 Earthquake – p.52-58 Flood – p.67 Landslide – 74-76 Wildfire – p.80 Severe Weather – p. 85-88		
B4. Does the Plan address NFIP insured structures within the jurisdiction that have been repetitively damaged by floods? (Requirement §201.6(c)(2)(ii))		Volume II, Flood p.66		
<u>ELEMENT B: REQUIRED REVISIONS</u>				
C1. Does the plan document each jurisdiction’s existing authorities, policies, programs and resources and its ability to expand on and improve these existing policies and programs? (Requirement §201.6(c)(3))		Volume I, Section 2. p.22-29		
C2. Does the Plan address each jurisdiction’s participation in the NFIP and continued compliance with NFIP requirements, as appropriate? (Requirement §201.6(c)(3)(ii))		P. 66, 102-103		
C3. Does the Plan include goals to reduce/avoid long-term vulnerabilities to the identified hazards? (Requirement §201.6(c)(3)(i))		Drought – p. 94 Earthquake – p. 97-100 Flood – p.122 Severe Weather – p.108-109		
C4. Does the Plan identify and analyze a comprehensive range of specific mitigation actions and projects for each jurisdiction being considered to reduce the effects of hazards, with emphasis on new and existing buildings and infrastructure? (Requirement §201.6(c)(3)(ii))		p. 91-110		
C5. Does the Plan contain an action plan that describes how the actions identified will be prioritized (including cost benefit review), implemented, and administered by each jurisdiction? (Requirement §201.6(c)(3)(iv)); (Requirement §201.6(c)(3)(iii))		p. 126 -134		
C6. Does the Plan describe a process by which local governments will integrate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate? (Requirement §201.6(c)(4)(ii))		p. 32-33, 126-134		
<u>ELEMENT C: REQUIRED REVISIONS</u>				
ELEMENT D. PLAN REVIEW, EVALUATION, AND IMPLEMENTATION (applicable to plan updates only)				

1. REGULATION CHECKLIST		Location in Plan	Met	Not Met
Regulation (44 CFR 201.6 Local Mitigation Plans)		(section or page)		
D1. Was the plan revised to reflect changes in development? (Requirement §201.6(d)(3))	p. 14-34			
D2. Was the plan revised to reflect progress in local mitigation efforts? (Requirement §201.6(d)(3))	p. 14-34			
D3. Was the plan revised to reflect changes in priorities? (Requirement §201.6(d)(3))	p. 14-34			
<u>ELEMENT D: REQUIRED REVISIONS</u>				
ELEMENT E. PLAN ADOPTION				
E1. Does the Plan include documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval? (Requirement §201.6(c)(5))	p. 5-6			
E2. For multi-jurisdictional plans, has each jurisdiction requesting approval of the plan documented formal plan adoption? (Requirement §201.6(c)(5))	p. 5-6			
<u>ELEMENT E: REQUIRED REVISIONS</u>				
ELEMENT F. ADDITIONAL STATE REQUIREMENTS (OPTIONAL FOR STATE REVIEWERS ONLY; NOT TO BE COMPLETED BY FEMA)				
The State of Oregon imposes no additional requirements upon local mitigation plans.				

SECTION 3: PLAN ASSESSMENT

A. Plan Strengths and Opportunities for Improvement

This section provides a discussion of the strengths of the plan document and identifies areas where these could be improved beyond minimum requirements.

Element A: Planning Process

How does the Plan go above and beyond minimum requirements to document the planning process with respect to:

- *Involvement of stakeholders (elected officials/decision makers, plan implementers, business owners, academic institutions, utility companies, water/sanitation districts, etc.);*
- *Involvement of Planning, Emergency Management, Public Works Departments or other planning agencies (i.e., regional planning councils);*
- *Diverse methods of participation (meetings, surveys, online, etc.); and*
- *Reflective of an open and inclusive public involvement process.*

Plan Strengths

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Opportunities for Improvement

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Element B: Hazard Identification and Risk Assessment

In addition to the requirements listed in the Regulation Checklist, 44 CFR 201.6 Local Mitigation Plans identifies additional elements that should be included as part of a plan's risk assessment. The plan should describe vulnerability in terms of:

- 1) *A general description of land uses and future development trends within the community so that mitigation options can be considered in future land use decisions;*
- 2) *The types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas; and*
- 3) *A description of potential dollar losses to vulnerable structures, and a description of the methodology used to prepare the estimate.*

How does the Plan go above and beyond minimum requirements to document the Hazard Identification and Risk Assessment with respect to:

- *Use of best available data (flood maps, HAZUS, flood studies) to describe significant hazards;*
- *Communication of risk on people, property, and infrastructure to the public (through tables, charts, maps, photos, etc.);*
- *Incorporation of techniques and methodologies to estimate dollar losses to vulnerable structures;*
- *Incorporation of Risk MAP products (i.e., depth grids, Flood Risk Report, Changes Since Last FIRM, Areas of Mitigation Interest, etc.); and*
- *Identification of any data gaps that can be filled as new data became available.*

Plan Strengths

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Opportunities for Improvement

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Element C: Mitigation Strategy

How does the Plan go above and beyond minimum requirements to document the Mitigation Strategy with respect to:

- Key problems identified in, and linkages to, the vulnerability assessment;
- Serving as a blueprint for reducing potential losses identified in the Hazard Identification and Risk Assessment;
- Plan content flow from the risk assessment (problem identification) to goal setting to mitigation action development;
- An understanding of mitigation principles (diversity of actions that include structural projects, preventative measures, outreach activities, property protection measures, post-disaster actions, etc.);
- Specific mitigation actions for each participating jurisdiction that reflects their unique risks and capabilities;
- Integration of mitigation actions with existing local authorities, policies, programs, and resources; and
- Discussion of existing programs (including the NFIP), plans, and policies that could be used to implement mitigation, as well as document past projects.

Plan Strengths

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Opportunities for Improvement

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Element D: Plan Update, Evaluation, and Implementation (Plan Updates Only)

How does the Plan go above and beyond minimum requirements to document the 5-year Evaluation and Implementation measures with respect to:

- Status of previously recommended mitigation actions;
- Identification of barriers or obstacles to successful implementation or completion of mitigation actions, along with possible solutions for overcoming risk;
- Documentation of annual reviews and committee involvement;
- Identification of a lead person to take ownership of, and champion the Plan;
- Reducing risks from natural hazards and serving as a guide for decisions makers as they commit resources to reducing the effects of natural hazards;
- An approach to evaluating future conditions (i.e. socio-economic, environmental, demographic, change in built environment etc.);
- Discussion of how changing conditions and opportunities could impact community resilience in the long term; and
- Discussion of how the mitigation goals and actions support the long-term community vision for increased resilience.

Plan Strengths

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Opportunities for Improvement

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B. Resources for Implementing Your Approved Plan

Ideas may be offered on moving the mitigation plan forward and continuing the relationship with key mitigation stakeholders such as the following:

- *What FEMA assistance (funding) programs are available (for example, Hazard Mitigation Assistance (HMA)) to the jurisdiction(s) to assist with implementing the mitigation actions?*
- *What other Federal programs (National Flood Insurance Program (NFIP), Community Rating System (CRS), Risk MAP, etc.) may provide assistance for mitigation activities?*
- *What publications, technical guidance or other resources are available to the jurisdiction(s) relevant to the identified mitigation actions?*
- *Are there upcoming trainings/workshops (Benefit-Cost Analysis (BCA), HMA, etc.) to assist the jurisdictions(s)?*
- *What mitigation actions can be funded by other Federal agencies (for example, U.S. Forest Service, National Oceanic and Atmospheric Administration (NOAA), Environmental Protection Agency (EPA) Smart Growth, Housing and Urban Development (HUD) Sustainable Communities, etc.) and/or state and local agencies?*